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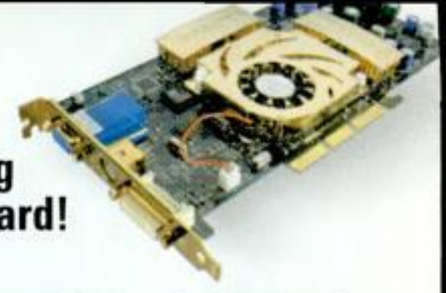

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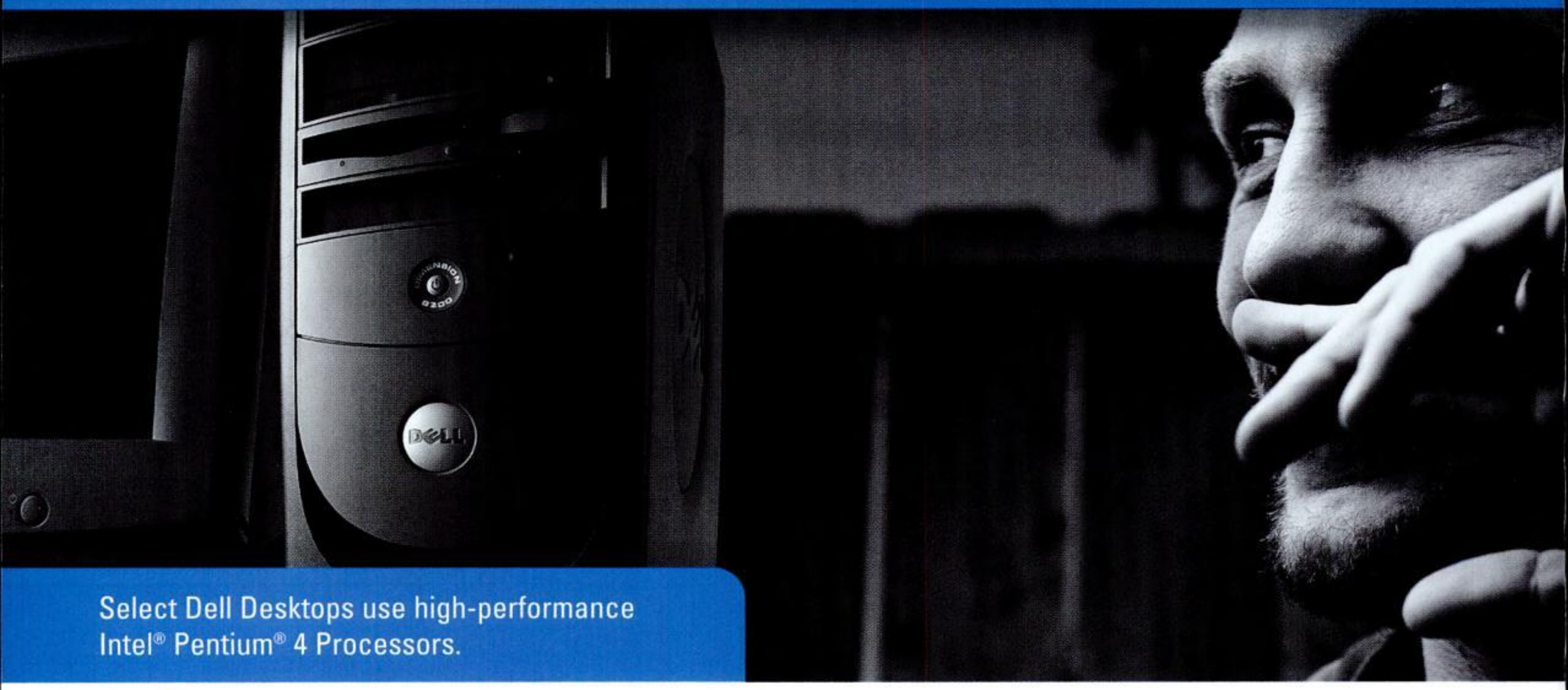

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Release Notes

A 3D Light at the End of the Tunnel

Let's connect the dots: Matrox is about a month away from shipping a new DirectX 8 videocard. Creative Labs's DirectX 8 part isn't far behind. By the beginning of next year, both nVidia and ATI will have released their insanely high-powered follow-ups to the GeForce4 and Radeon 8500. All this silicon will give hardware freaks no fewer than *four* 3D accelerator choices, each of which will play DX 8 programmable shader games, as well as offer some type of DirectX 9 compliancy in one way or another.

What the hell is going on?

Peter N. Glaskowsky, editor-in-chief of the *Microprocessor Report*, says the videocard companies are all looking to cash in on the eventual release of programmable shader titles like *Doom III*, *Unreal Warfare*, and all the sundry games based on their engines. Well, guess what? We're finally seeing *Doom III* screenshots, and the level of modeling detail and dynamic lighting looks absolutely amazing. Just do a search for the images online, and you too will be floored. Indeed, like we proclaimed in April: You won't see graphics like this on your stinkin' game console!

But we're not out of the woods yet. Each of the four next-gen videocards should be able to render *Doom III* and all of its special shader effects, but I doubt that Matrox's new Parhelia card—in its current iteration—will offer enough raw performance to play the game at acceptable frame rates at 1280x1024 and maximum detail levels. Creative Labs might find itself in the same predicament, but it's way too early to tell. For Matrox, it's really a matter of slow core clock speed, not shader features, so hopefully a die shrink will allow the basic Parhelia architecture to trample the 300MHz mark by *Doom III's* release.

For now, *Doom III* is still but a far-off dream, and we're all stuck with basic DirectX 7 content. But this doesn't mean that 3D has to be boring. For direct evidence, I invite you to check out the Maximum PC 3D Screensaver, which has been distributed on the last few Maximum CDs, and is available at **www.upgradesource.com/maxpc.html**. It includes a frame rate counter to help you gauge system performance, and might even tide you over until 3D really heats up in 2003.

Things are looking good, hardware freaks. We just have to be patient.

—JON PHILLIPS

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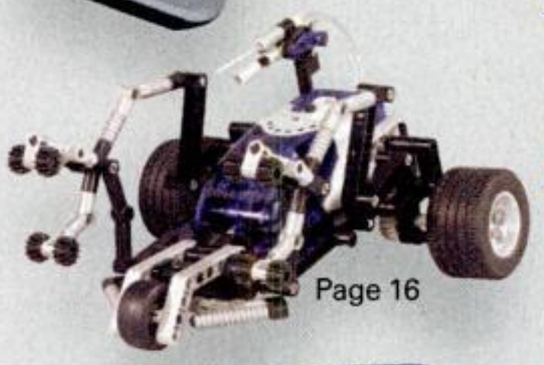

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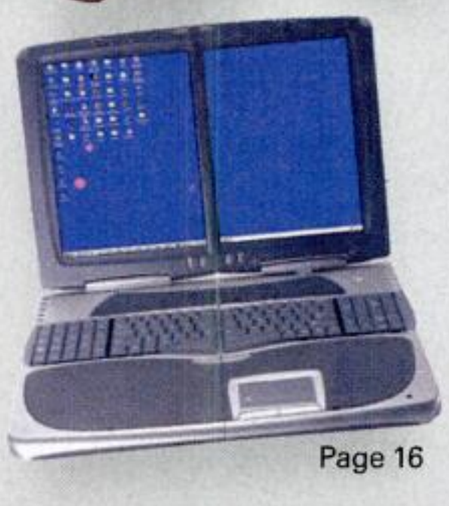

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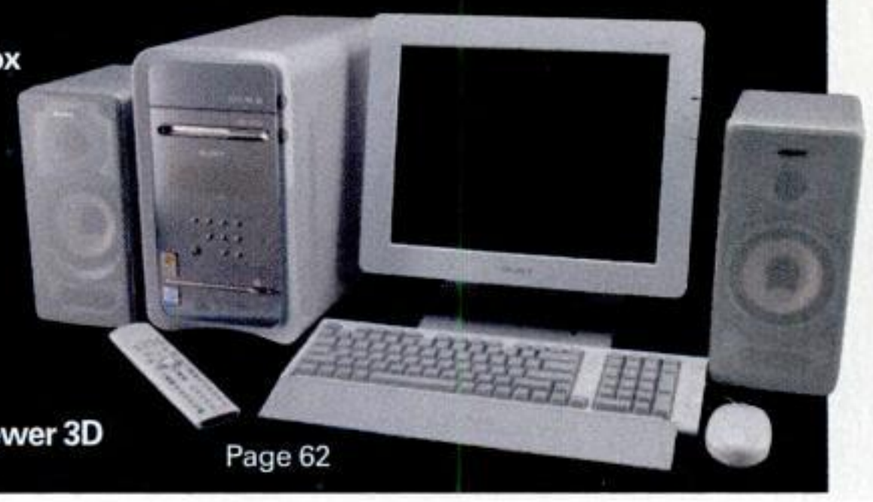

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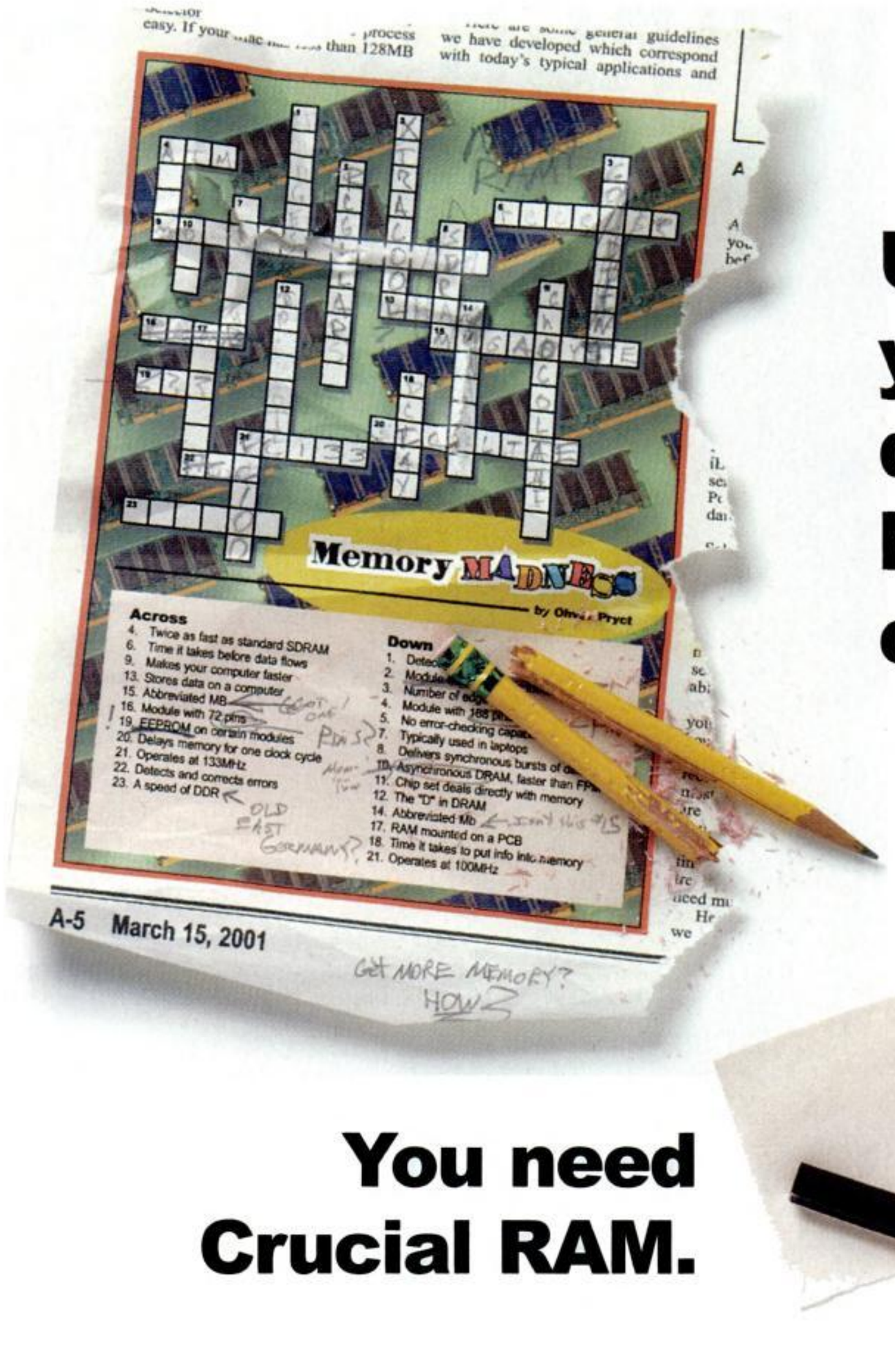

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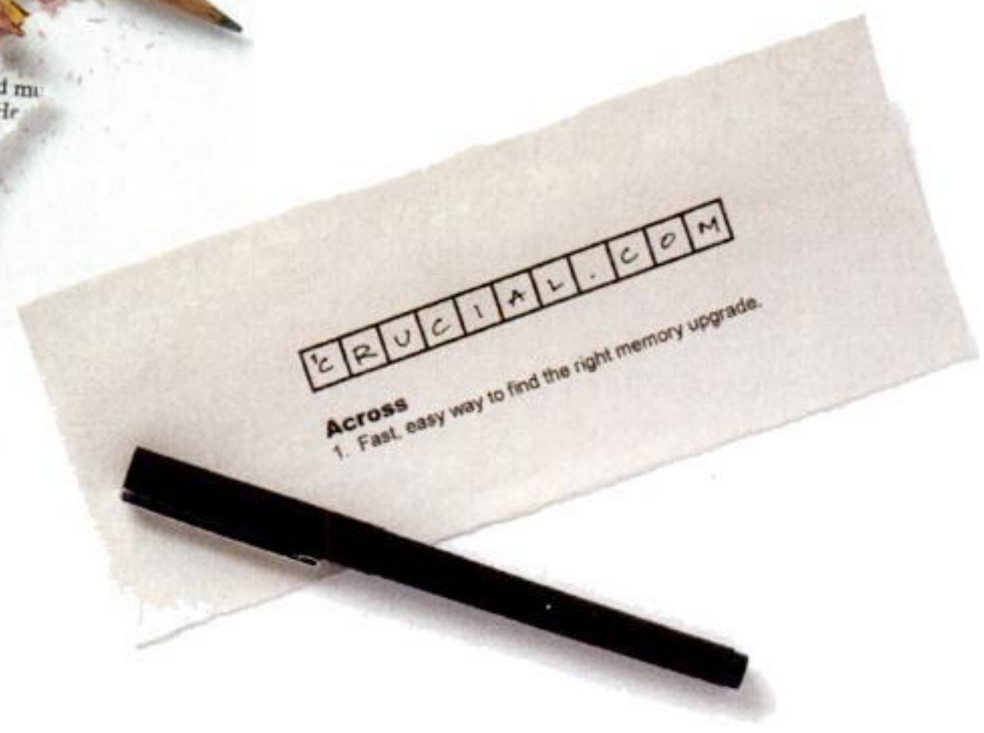

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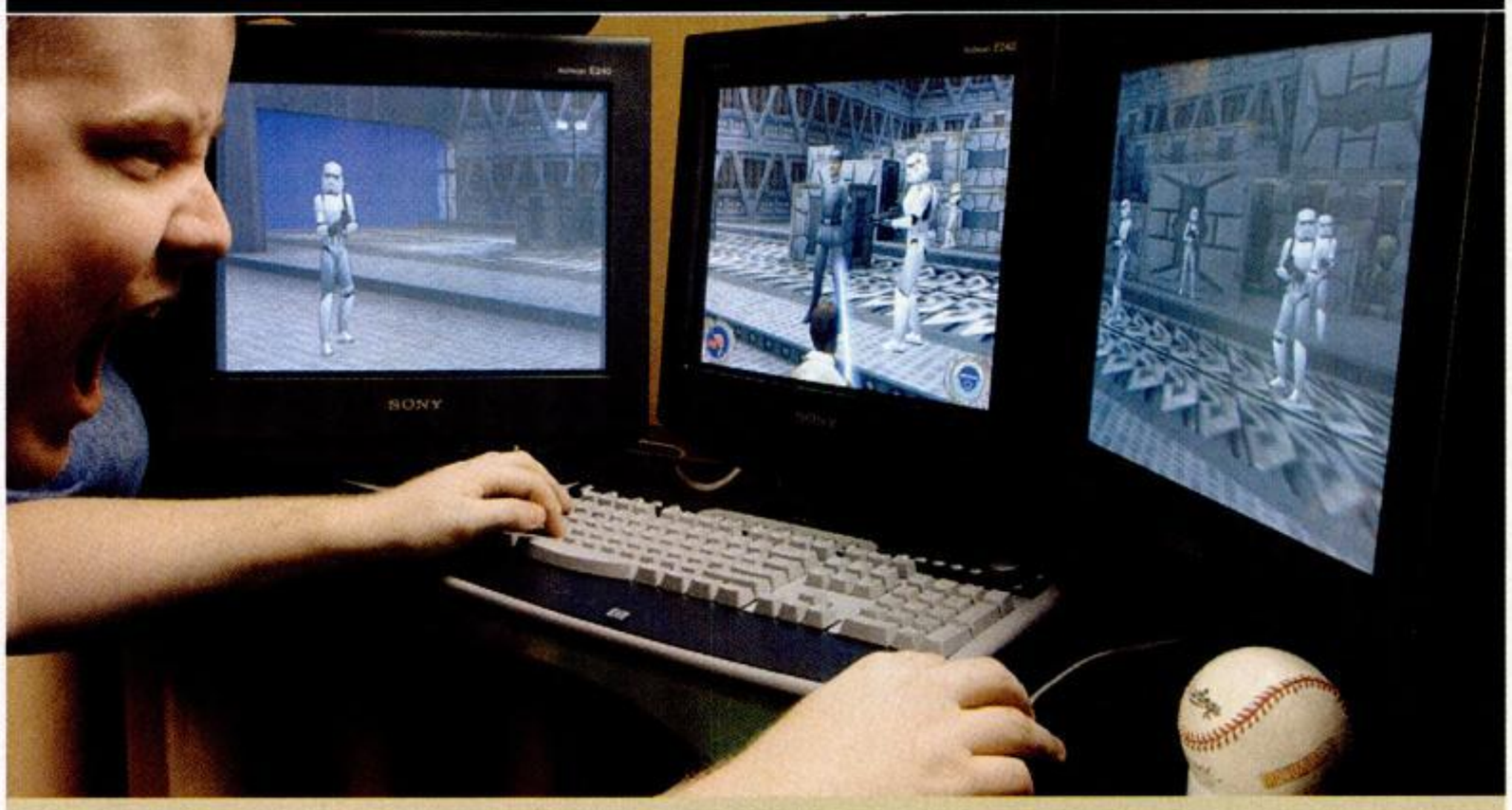

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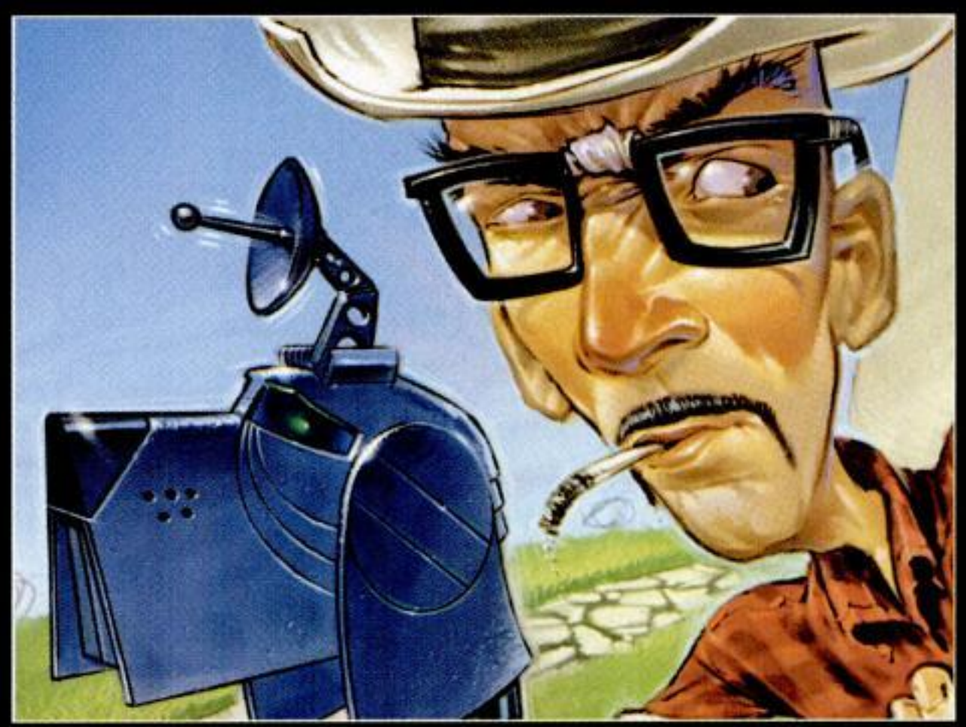

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In/Out

You write, we respond

Where's my Mother-board?

At just three months old, Aiden Kennedy is already helping his father build a new server for the home network. One afternoon, after getting my new case, I spread everything out on the bed in the office. I've been trying to get Aiden to participate when I work on computer hardware, and I think he's beginning to understand my obsession with the newest technology. Although he's really learning quickly, an Athlon 2100+ is probably a more suitable CPU for the new server, so Aiden had to go. Plus, baby drool doesn't mix with DDR memory.

Late at night, when we're reading *Maximum PC* together, I start to wonder if Aiden knows what he's in for!

—NATHAN KENNEDY

MORE ON MP3s

Regarding your June 2002 cover story "MP3 2.0": Most MP3 enthusiasts who want to create archival-quality MP3s don't use CBR anymore. VBR is the most efficient way to encode while using the least amount of space. CBR 256 is very good, but there are always some passages in every file that require 320kbps but will be encoded at 256kbps (and space will be wasted encoding material at 256kbps that could have easily been encoded at 160kbps or 192kbps). VBR is the best solution in both cases, and *LAME* includes an "archival quality" VBR setting in the form of the "--r3mix" command-line switch. You can learn more about this switch and what it entails at **www.r3mix.net**. In fact, the only reason *not* to do VBR is if you're using older MP3 devices (like the original Nomad) that can't properly interpret the length of a VBR file.

—JIM LEONARD

"P.S. Lest you think I don't like DSL, let me disabuse you...."

DSL DISSECTED

I was flipping through your May issue, and was surprised to see the "DSL Hell" feature. I cracked a smile and started reading because I work for a DSL company's help desk, and fully know each of the questions and issues that was addressed. You guys hit the nail on the head for each and every one! I talk to people time and again who have security systems and want to set up networks, and to whom our sales department has said "that's no problem," neglecting to add "as long as you get a filter for that security system," or "but we don't support networks."

You don't know how many times I have called the sales department, complaining and moaning on the customers' behalf that the sales people NEED TO TELL THE WHOLE TRUTH.

—JAMES HOEGL

First, I want to say that you put together an excellent article on the perils of being a DSL subscriber. While most people may not have much choice about who'll be their provider, your article will prepare them for what lies ahead. There are, however, three aspects of DSL hell (as experienced by myself and my colleagues) which you didn't mention:

- Will your DSL provider allow you access to the *entire* Internet? My provider blocks certain news groups—so ask first!
- If you're considering going with a provider other than your local phone company, find out what kind of track record they have for successfully connecting their subscribers. One of my colleagues waited two full months (amid a series of excuses from the prospective ISP as well as the phone company), then gave up and subscribed with the phone company. He was connected within days.

  This situation may have been due to genuine technical difficulties or to phone company skullduggery. Either way, you'll want to know if a third-party ISP can successfully deal with the phone company.
- Don't forget to check software compatibility. One of the most important applications you may want to run is the VPN software that lets you connect at high speed with your employer's intranet. Working

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from home at high speed is a great way to make up the cost of your DSL connection. Unfortunately, after I changed jobs recently, I installed the VPN drivers from my new employer and nearly disabled my system. It turns out the VPN is incompatible with PPPoE, which is all my DSL provider offers. When I connect to work from home, I have to do it via dial-up. YECHH!

P.S. Lest you think I don't like DSL, let me disabuse you: It's fast, it's almost always up, and when the cable company offered to hook me up, I told them to get lost.

—BOB CRUZ

IMAC ATTACK

This letter regards the iMac article on pg. 62 of your May 2002 issue. I am sickened by the attempts to compare the iMac with a top-end PC, thereby giving us a meaningless comparison. C'mon, we're smarter than this. We know that the iMac doesn't stand a chance. We also know that it's not meant as a performance desktop, nor is it Apple's most powerful offering. So why don't you compare it to a similarly priced and outfitted computer? The Polywell not only has a $500 advantage (and no monitor), it doesn't have a DVD-burner either. Why not build or find a PC with a 15-inch LCD and a DVD-Burner for $1800, then start the comparisons? Then we can actually start talking about performance and options.

—GAETAN VOYER-PERRAULT

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: As we stated in the intentionally whimsical iMac write-up: "We could easily configure a fully-decked 1.73GHz Athlon XP rig to be cheaper than the iMac, and *still* make the $1,800 iMac its plaything." So why didn't we? Because the iMac evaluation was a last-minute addition to the May issue, and we didn't have time to requisition and put together all the parts for a comparably priced PC. Simple as that.

If we had any concern whatsoever that an $1,800 PC might lag behind the iMac during benchmarking, we'd give the Apple machine a second look. But let's be real: The iMac is all show, no go. We could even factor a 15-inch LCD and DVD burner into the PC's price tag, and the PC would still win. We know this, our readers know this, and I bet even Apple knows this. New benchmarking runs aren't necessary.

DATA-PLAYED

I first saw a DataPlay device at the Consumer Electronics Show, and as a result, I decided to hold off on buying an MP3 player until DataPlay devices come out. Solid-state and hard-drive players are just too damn expensive when you're in high school. The DataPlay site claims that players will be released the second quarter of 2002. Well, that's right now, and I'm wondering how long it's going to be before I can buy one.

—JACOB WAGNER

FEATURES EDITOR LOGAN DECKER RESPONDS: We were momentarily dazzled by the promise of DataPlay discs and players in June 2001 when we did our removable-media roundup. Even though it hadn't yet hit the market, we thought it was promising enough to include in our roundup anyway. Back then, DataPlay had already delayed its launch, and didn't foresee any players hitting the market until late 2001. DataPlay now tells us the first players should appear at "the end of June or early July."

This disc-based technology, similar to Iomega's moribund PocketZip, isn't particularly complicated. The delays are probably due to the manufacturer's apprehensions about a new format and, more importantly, its attempts to get record companies interested in distributing music on the tiny, quarter-size discs. DataPlay claims that several albums could be recorded to a single disc, and these albums could be unlocked through a web interface.

But there's still a lot we don't know about this format. For example, what kind of compression scheme will be used to fit "several albums" on a single 500MB disc? What odious "digital rights management" did the record companies demand before signing on? And how much cheaper would it be to unlock an album from a DataPlay disc vs. buying a CD at the record store (we are talking about the recording industry, after all)?

We were at CES, too, and at that time, we didn't see any DataPlay devices that were priced at less than $300. Of course, the price will come down eventually, but by that time, you will have graduated high school, and can ask for a solid-state player as a gift, or maybe as a bribe for going to college.

WILL RAMBUS RULE?

Great article regarding upcoming DDR and RDRAM technologies [Quick Start, May 2002], but I'm not so sure that Rambus will be the one "doing the sweating" first. It seems you left out one important point—latency.

We usually want to buy memory that has a latency factor less than CL3, preferably CL2. With higher latencies, you eat precious clock cycles just to access different sections

The wee DataPlay media format showed a lot of promise back in June 2001.

in RAM. Although theoretical bandwidth keeps climbing the scale, latency continues to get worse. From what I've heard, DDR is slowly approaching the end of the road. When it comes to DDR400 and

"I am sickened by the attempts to compare the iMac with a top-end PC."

DDR533, I hear manufacturers are having a heck of a time trying to keep latency below CL3, some saying it'll be near impossible.

Until memory developers change to a "serial" interface, there might not be much breathing room left for DDR. As this latency factor grows in DDR, RDRAM will truly shine. As I understand it, Rambus is able to increase theoretical bandwidth in RDRAM at a greater rate than DDR without sacrificing as much to latency. Because of this, it'll be the DDR architects sweating before too long. Am I wrong?

—CARL CANTER

SENIOR EDITOR GORDON MAH UNG REPLIES: Well, technical issues aside, I think Rambus execs do foresee a problem next year — and that's what we were referring to in our "sweating" comment.

Intel seems to be giving Rambus, Inc. the cold shoulder these days. Rambus had always hoped to provide consumers with the mainstream memory of choice, but:

- **Intel has effectively made peace with the DRAM manufacturers, and is behind DDRII as the heir to the PC main memory throne.**
- **Intel hasn't said anything about adopting Rambus's future memory technologies, such as Yellowstone.**
- **Intel's roadmaps show RDRAM occupying a very small sliver of the high-end**

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COMING NEXT MONTH

IN THE AUGUST ISSUE OF MAXIMUM PC

Give Your PC a Clean Start!

There's nothing like driving a hot-rod right after a tune-up. It's responsive, quick, and feels just like new. We'll show you how to get the same feeling from Windows XP—whenever you want, as often as you want—by creating bootable CD-ROMs of your OS, all your preferences, your networking settings, and your favorite apps. Ready to load at any time. Ready to rescue you from disaster. Step-by-step, idiot-proof instructions for angst-free PCs!

Massive LCD Monitor Showdown!

Now that giant, 2-feet deep monitors are creeping toward obsolescence, we asked manufacturers to give us the brightest and the lightest of their LCD flock. And did they ever. This August, we're reviewing more than a dozen of the latest LCD monitors and pitting them against each other in the screen test of the century! Which ones are crisp enough to replace your CRT? Which ones can handle intense gaming without degenerating into a streaky mess? Find out next month which ones will make you want to ditch that hefty CRT once and for all!

3Dlabs, the Videocard Slayer!

This is one wacky summer for geeks. Creative Labs and 3Dlabs are putting their, um, labs together to create a videocard that they claim will offer far more programmability than anything from nVidia, ATI, or Matrox. Do they have a winner on their hands, or are they just full of it? We're taking a close look at the latest contender in the GPU wars!

Reader Letters

market share for the next year or two.

➤ Even in the new 850E chipset, there's "official" support for only PC800 RDRAM, not PC1066. Intel's official story is that there aren't sufficient resources (or even the need to qualify) the chipset for PC1066.

➤ In the workstation arena—where Intel once said RDRAM was required to keep CPUs well-feed with data—the company is pushing a dual-channel DDR SDRAM chipset, not the RDRAM 860. And some motherboard vendors have recently told us that Intel intends for the 860 to be the final RDRAM chipset for Xeons.

All this points to the end of RDRAM as the main memory of choice in desktop and workstation PCs. There is some glimmer of hope, though. PC1066 RDRAM is a hit with the hardware web sites; SiS is rumored to have its RDRAM chipset on schedule for this year; and Intel is offering "nudge, nudge, wink, wink" support for PC1066 in its motherboards.

I agree that the future of the PC is in high-speed serialized interfaces. We long ago said that DDR266 couldn't compete with RDRAM. RDRAM scales better, and, with its narrow interface, is supposedly easier to work with when it comes to designing motherboards. In the end, however, Rambus needs Intel to make a sudden U-turn, or RDRAM will never be the mainstream memory of choice.

"He may be able to fool himself into thinking he can drive and keep an eye on a movie at the same time, but it's only a matter of time before he's taken by surprise..."

SIR, DO YOU KNOW WHY I PULLED YOU OVER?

I can appreciate an original, well-executed PC design as much as anyone else, and Mike Knudsen's Cobra PC [June, Rig of the Month] is all of that. What bothers me are his comments about watching movies while driving. If he is serious about this, he's foolhardy at best, and has sh*t for brains at worst. He may be able to fool himself into thinking he can drive and keep an eye on a movie at the same time, but it's only a matter of time before he's taken by surprise by a fast-occurring situation on the road, and is unable to react in a timely manner.

I also think *Maximum PC* could have demonstrated a little more judgment in its remarks. You guys are creative enough to find a way to express admiration for Mr. Knudsen's work, while at the same time pointing out the incredible foolishness of his remarks.

—JOHN C. LIND

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: Because Knudsen was so thoroughly whimsical in all of his interview responses, we assumed that he was also yanking our floppy cables when he described his "unique" driving style. But it's never too late to set the record straight: We don't know what Mike Knudsen does with his free time, but we sincerely hope it doesn't pose a danger to himself or others. (I suspect that he exercises much more caution than what was implied in his e-mails to the magazine.)

Personally, as a fan of high-performance sports cars, I'm also a big proponent of extended driver's education for anyone who gets behind the wheel of an automobile. A good car control clinic will teach you emergency braking, accident avoidance, and the precise limits of your car's cornering abilities (it sounds like fun because it is). You'll also learn to put down the junk food, toss the cell phone, and turn off the PC while driving.

I should add that since our June issue hit newsstands, a number of readers have informed us that some states prohibit the installation of large LCDs visible from the driver's seat. These screens must be restricted to the rear seats to prevent driver distraction.

AND ANOTHER PUBLIC-SAFETY ADVISORY...

Sorry, but as a real-life cop I have to nit-pick "The Last Days of 3dfx" (June, 2002). There are two pictures showing a security guard with his finger inside the trigger guard of his firearm. Any trained professional knows never to put a finger inside the trigger guard until actually firing the weapon. Watch any episode of "COPS," and you'll notice that officers always rest their finger along the frame of the gun to avoid an accidental discharge. From this position it takes just a millisecond to slide the finger onto the trigger if the need arises.

—JOSEPH VERNON CHAPMAN

SENIOR EDITOR AND 'COPS' FAN GORDON MAH UNG REPLIES: I wasn't present at the photo shoot but I completely agree that the finger should have been indexed and not in the trigger well. However, I would argue that not all sworn officers or professionals are trained enough to remember this precaution. Witness the creation of the "New York" trigger for the NYPD after the department had numerous accidental discharges (ADs), some of which involved the deaths of suspects that had already surrendered. The ADs would suggest that some NYPD officers kept their fingers on the trigger when they weren't supposed to. Furthermore,

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MAXIMUM PC's

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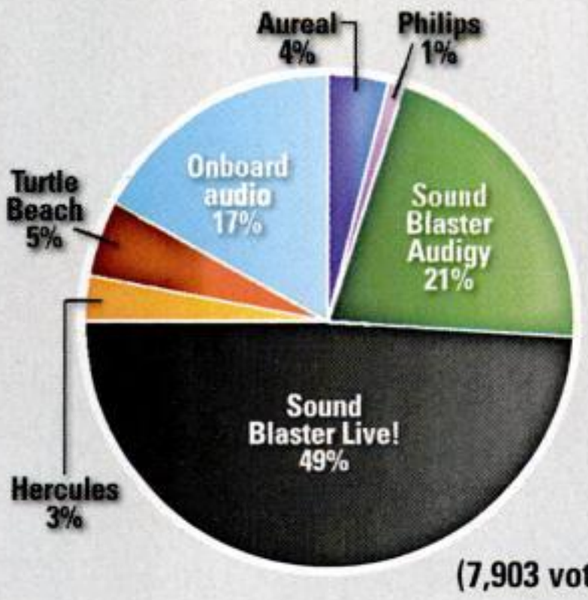
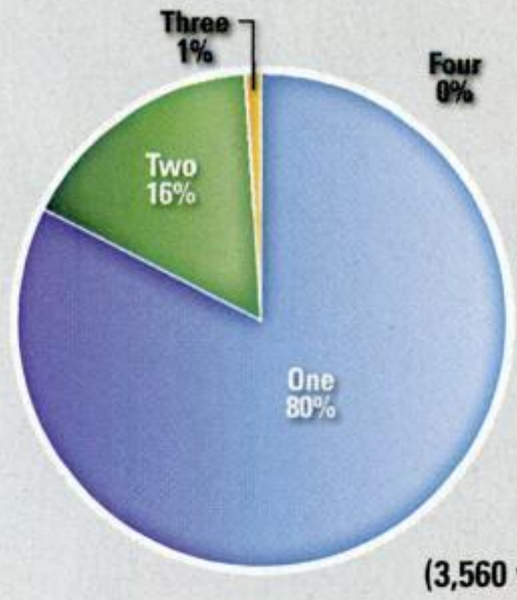
What audio are you running in your PC?



(7,903 votes)

Who said discrete audio was dead? With 70 percent of respondents running Live! or Audigy hardware, Creative Labs proves it's still the 900 lb. gorilla of audio. Surprisingly, despite the good press for Philips and Hercules cards, the two combined equal the number of people still running ancient Aureal equipment.

How many monitors do you have hooked up to you PC?



(3,560 votes)

48 respondents are claiming to run three monitors. We're not so sure we believe it. However, once Matrox releases its upcoming videocard, a triple-monitor setup may become commonplace. See our cover story on pg. 28.

there are numerous incidents of ADs by officers all over the country. It all comes down to training, training, and more training. And even then, the training may not kick in when stress is at a high and the adrenaline is pumping. Especially when there's a Voodoo5 videocard at risk.

The amateur handling of the firearm in the "The Last Days of 3dfx" could be indicative of a few things:

- **The security guard was a rookie, plain and simple.**
- **The security guard had just fired a warning shot to let the scientist know just how damned serious they were about retrieving that Voodoo5.**
- **The security guard had just made a career move from Burger King after being discharged for not making proper change.**

In the end, though, it's always important to practice the utmost safety when operating a firearm. Thanks for pointing that out.

CACHE AS CACHE CAN

Remember once upon a time everyone thought L2 cache was going to make our P-IIIs into screamers? Where did the L2 cache go? Why do some motherboard descriptions include the L2 cache while other "official motherboard specs" don't even mention it? Has 256K been the L2 standard for so long that manufacturers don't feel they need to mention it? We've seen newer boards with 512K cache, but when are they going to open up the technology, and how will it improve performance? I was hoping you could shed some light on this.

—LUKE HAMBLEN

SENIOR EDITOR GORDON MAH UNG RESPONDS: For starters, we don't know what the heck you're talking about. Are you referring to the motherboard-bound cache used during the late 1990s? It's toast. Modern CPUs (including the P-III you mention) have never used motherboard cache; all L2 cache is either closely coupled to the processor die, or integrated into the die itself. External cache hasn't been implemented since the days of the K6-2/K6-III. No P-II or P-III motherboard that I know of has ever had external cache.

Intel and AMD moved away from external cache because it's often very, very slow. It never really advanced beyond 100MHz, which is how fast it ran during the Super Socket 7 motherboard days. Routing a signal from the CPU core, through a socket or slot, then to cache memory two inches away is an awfully tall order. And it becomes even hairier if you try to run the cache even *half* as fast as today's CPUs.

Micron actually proposed a concept called eCache a couple years ago. It would have added 8MB of "L3" cache to motherboards (the L1 and L2 being in the CPU). But no one has implemented eCache, as far as I know. More recently, Apple added a 2MB L3 cache to its dual 1GHz G4s. The cache is DDR, and runs at 200MHz, but is then pumped out to the slower PC133 system memory.

You also have to consider that extra L3/L2 cache doesn't necessarily improve performance. Server applications tend to benefit from larger L2/L3s, but there's often not too many benefits for typical desktop apps and games. The Northwood P4 got a huge speed boost when it doubled its L2 to 512K, but it's not clear if desktop apps would get much more performance if the Northwood jumped to a 1MB of L2. For what it's worth, the next iteration of the Athlon will double L2 cache to 512K.

WHATCHU TALKIN' 'BOUT, WILL S.?

So, uh, why do the hardware-review guys hate geese [May 2002, pg.68]?

—BILLY TURNBOW

TECHNICAL EDITOR WILL SMITH RESPONDS: Remember when you were a little kid, sitting in a park with your parents, feeding ducks a nutritious diet of stale white bread? Do you remember those nasty geese that would come up and chase the nice ducks away? Remember how they weren't satisfied with just your stale bread, but also wanted a taste of finger, or a chunk of flesh from your leg? That, Billy, is why we hate geese. ■

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CUT, COPY, PASTE

In "The Last Days of 3dfx" (June 2002), we identified one of the companies that 3dfx purchased as being Gigabyte. The company was actually called Gigapixel.

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BE A

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Quick Start

The beginning of the magazine, where articles are small

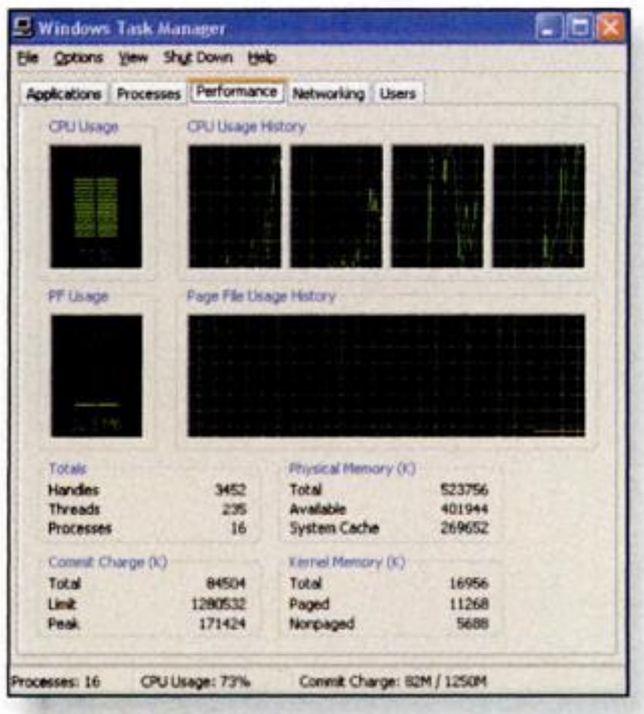
Hyper-Threading: Making the Most of Idle Circuits

'Free performance' could arrive on Intel desktops by 2003

All the gigahertz in the world won't compensate for your CPU's most profound limitation: It can execute only one instruction thread at a time. Intel is hoping to sidestep this problem with Hyper-Threading, a new technology that increases CPU efficiency without drastically increasing die size and power consumption.

Consider the typical processor: It's like an automobile factory that must always complete the order of one customer before moving on to the order of another. Because instructions can only be executed sequentially, most of the CPU's assembly lines—that is, function units—just sit idle. In fact, Intel says that typical CPUs tap only about 35 percent of their resources at any given time.

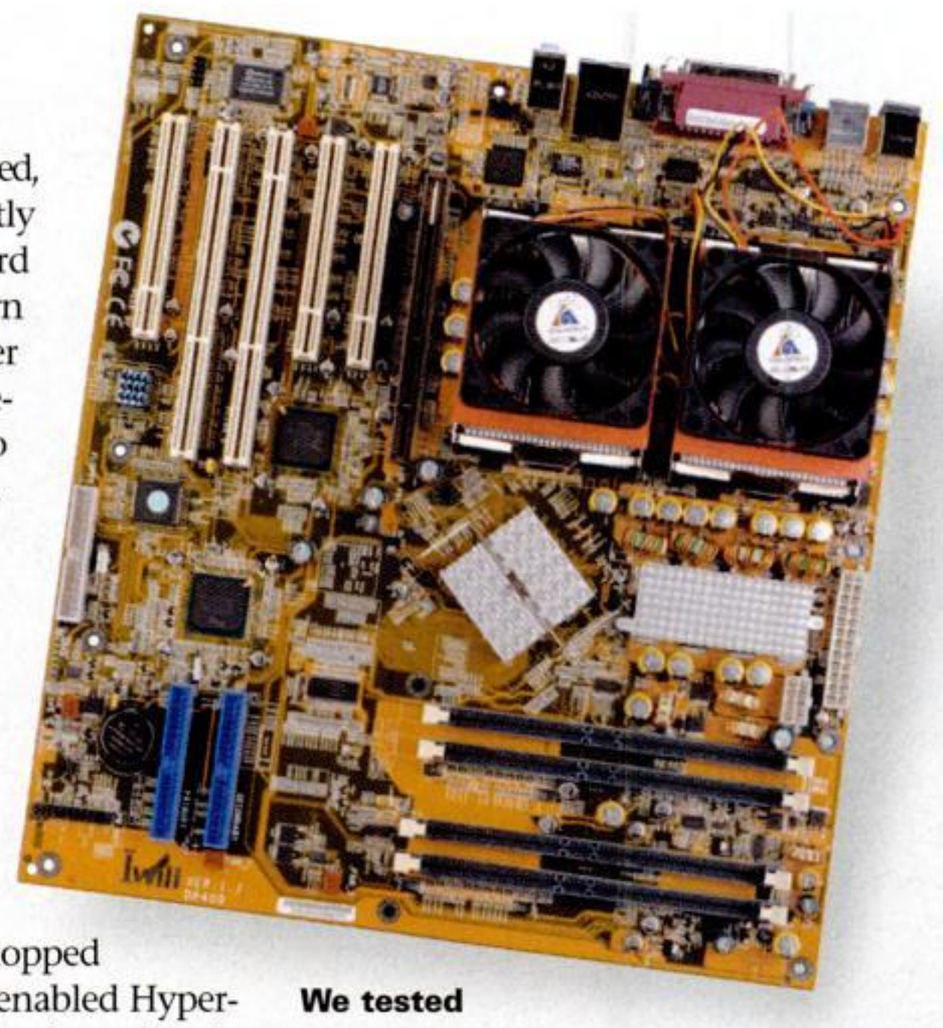
A traditional solution like symmetric multiprocessing (SMP) addresses the problem by using multiple CPUs—dual-proc systems can execute two instruction threads simultaneously. The downside is that every additional processor in an SMP system costs money. Another approach is to build two CPU cores into a single die. This is called chip multiprocessing, or CMP. The problem with this approach is that you get fewer CPUs per fab wafer, as well as increased costs across the board.



Notice that Windows XP Professional sees the pair of Hyper-Threaded Xeons as four CPUs.

Enter Hyper-Threading, Intel-style. Requiring just 5 percent of a CPU's die real-estate, Hyper-Threading makes a single processor appear as two independent processors to a compatible OS. The two virtual factories can then handle separate instruction threads simultaneously. The foundation for Hyper-Threading has actually been in the Pentium 4 core since the processor launched, but Intel has only recently allowed its motherboard and BIOS partners to turn it on, and only in server boards, where the benefits will be tangible. (To run Hyper-Threading, you need support in your CPU, core-logic chipset, BIOS, and OS.)

Intel says the technology isn't yet mature enough for the desktop, a claim backed up by our own independent tests. We took an Iwill DP400 motherboard, plopped in two 2.2GHz Xeons, enabled Hyper-Threading in the BIOS, and ran the rig through a few benchmarks. While we recorded a 10 percent performance boost in Newtek's *Lightwave* (a 3D modeling app), as well as significant boosts in the synthetic *SiSoft Sandra* tests, we saw a major performance drop in the content creation portion of *SYSmark2002*. Turning on Hyper-Threading knocked its scores all the way from 311 to 251.



We tested Hyper-Threading by enabling it in the BIOS of this Iwill DP400 dual-Xeon motherboard.

This is where reality rears its ugly head. The Hyper-Threaded system might *look* like it has two CPUs, but its intrinsic processing resources are still that of just a single-CPU system.

Let's go back to our factory analogy. If one of the virtual CPU factories accepts an order to manufacture, say, 20 pick-up trucks, then the second virtual CPU factory takes an order to manufacture *another* 20 pick-up trucks, the entire truck-making assembly line gets bogged down with congestion. The single CPU jumps back and forth trying to fulfill both orders at the same time, and wastes a lot of processing cycles as a result.

As always, the problem is with the software. Today's software doesn't know the difference between an SMP system and one with Hyper-Threading. When dealing with an SMP system, it's OK to place two orders for 20 pick-up trucks each. But when dealing with a Hyper-Threaded system, the software needs to be intelligent enough to only place simultaneous orders for, say, 20 pick-up trucks and 20 compact cars. Because each order taps a different CPU resource, this kind of simultaneous execution is OK.

Intel is encouraging developers to directly code their apps for Hyper-Threading. So if an application finds that it's about to ask both virtual CPUs for similar resources, one of the virtual CPUs will take a breather, and the instruction will be executed on the other. But of course, Hyper-Threading works best when orders are balanced, and trucks and compact cars are cranked out simultaneously.

While Hyper-Threading sounds promising, not everyone is buying into it. AMD has long considered the dual-core die approach for its 64-bit Hammer series, and is unlikely to embrace anything similar to Hyper-Threading. And at present, Intel says its use of Hyper-Threading in Xeon machines is mainly for developmental testing. Consumers won't get a taste of Hyper-Threading until late 2003 at the earliest. This is when Intel will introduce its Prescott CPUs based on a 0.09-micron process.

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3D Hardware Race Heats Up

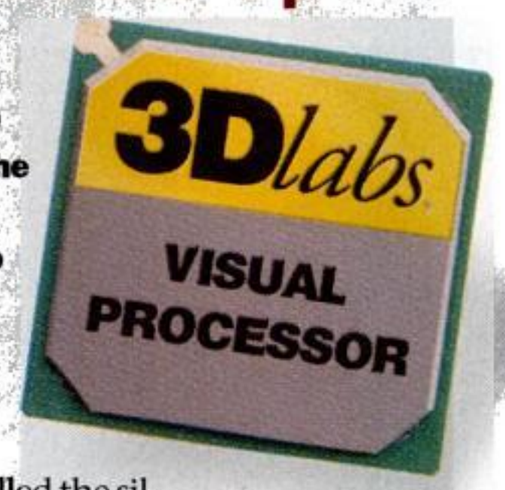
Later this year, the competition to be top gun in consumer 3D graphics will go from a two-way race between nVidia and ATI to a four-way race that includes Creative Labs (which is poised to buy 3Dlabs for its intellectual property) and Matrox. Why so much action all of the sudden?

"The market is being reinvigorated by the widespread availability of programmable graphics engines, and the pending release of new titles such as *Doom 3* that take good advantage of this technology," says Peter N. Glaskowsky, editor-in-chief of the *Microprocessor Report*. "Microsoft and the OpenGL consortium have both pushed to get this technology spread more widely than perhaps ATI and nVidia would like. But it'll help the market to have more than two choices for fast, flexible GPUs."

Besides Matrox and Creative Labs, core-logic chipset maker SiS has introduced a discrete graphics chip, and VIA Technologies is working to improve the performance of its graphics technologies. Of course, the ultimate goal of the companies isn't to give consumers better frame rates—it's to make money, and the 3D upstarts see an attractive opportunity to do so, says Jon Peddie of Jon Peddie Research.

"They're in competition for what's called the silicon budget," Peddie says. When an OEM creates the budget for one of its new PCs, it sets aside a fixed amount that will go toward the CPU, RAM, core-logic chipset, audio chips, and graphics chip. In the last few years, CPUs, RAM, and chipsets have gotten cheaper while graphics cards have become more expensive. The upshot is that the graphics companies want to exploit OEMs' propensity to spend money.

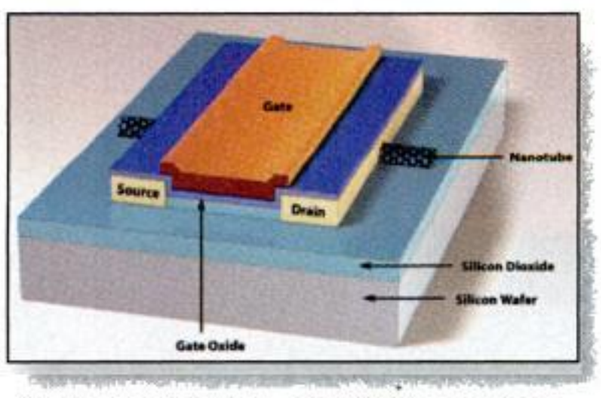
And winning the race isn't always necessary. A representative of 3Dlabs told us that Creative Labs could still make a nice amount of money selling videocards even if the new 3Dlabs P10 chip doesn't become a market leader. Because Creative will actually own the intellectual property on the boards it sells, profit margins will be significantly higher than what the company enjoyed when it left the U.S. videocard market in year 2000.



3Dlab's new P10 chip is the fourth player to join the race.

IBM: Carbon Is Faster Than Silicon

IBM scientists say they have successfully pushed transistors made of carbon nanotubes beyond those made of silicon. This could be good news for Moore's Law–breakers, because most are predicting that the chip industry will hit a wall in the next two decades with its current silicon technology.



A cross section of IBM's carbon nanotube field effect transistor.

IBM first unveiled transistors made of carbon nanotubes in 2001. Big Blue's scientists say they have now successfully created carbon nanotubes that are similar to conventional silicon transistors. Because of the similar structures, the scientists say they have been able to compare silicon to carbon nanotubes, and carbon kicks butt.

Carbon nanotubes are said to be the strongest conductive fibers known to man, and are 1,000 times stronger than steel. The first carbon nanotube transistor IBM created measured just 10 atoms in diameter—500 times smaller than today's silicon-based transistors. For more info, go to: **www.research.ibm.com/resources/press/Transistors/.**

FAST FORWARD BY TOM R. HALFHILL

USB & Fries to Go

Burned by FireWire's ability to connect devices without a host PC, the USB consortium is pushing a new standard called USB On The Go (USB-OTG). It allows two USB devices to talk directly to each other, even if one of them isn't a PC.

The first USB-OTG products will appear this year. There are numerous applications. For example, USB-OTG could allow a digicam to interface directly with a photo printer or another camera to print or exchange pictures. Two PDAs could exchange data, or a PDA could share an address book with a smart phone. An MP3 player or PDA could store files on a disk drive. A scanner could join forces with a network printer for sending faxes. A digicam could use a cell phone to transmit photos. A full-size keyboard could attach to a PDA.

Those combinations and many others aren't possible today in a standardized fashion because USB has a PC-centric tree topology: A PC is the host, and USB devices attach like branches. In contrast, the IEEE-1394 FireWire standard has a flexible peer-to-peer topology that allows FireWire devices to attach directly to each other, although a PC is usually involved. A few existing USB devices (such as some Hewlett-Packard digicams and ink-jet printers) can link together without a PC, but that's because one device imitates a PC, and it's a proprietary hack. USB-OTG standardizes the relationship.

Note that USB-OTG is a supplement to USB 2.0, not a replacement. It adds a new host-peripheral point-to-point specification and defines some new connectors. The connectors are smaller than regular USB connectors and include a Mini-AB port (for host/peripheral devices), a Mini-B port (for peripheral-only devices), and cables with Mini-A and Mini-B plugs. New adapters allow USB-OTG devices to work with existing USB devices and PCs.

The USB-OTG spec has some limitations. It allows just two USB-OTG devices to join together, and one device must have host or host/peripheral capability—it's still not a true peer-to-peer bus like FireWire. The cabling combinations might be confusing: Some devices can't be hosts and won't accept Mini-A plugs, and when both devices are potential hosts, the Mini-A plug determines who's boss—unless they agree to switch roles. USB-OTG doesn't support the new high-speed 480Mbps data rate of USB 2.0; the maximum speed is 12Mbps. Also, a USB-OTG peripheral can't draw more than 8 milliamps of power from a USB-OTG host device; regular USB supplies 500mA.

Despite those drawbacks, USB-OTG extends USB in useful ways while preserving as much compatibility as possible. My crystal ball foresees a bright future.

Tom Halfhill was formerly a senior editor for Byte *magazine and an analyst for* Microprocessor Report. *He is now a technical writer/analyst in Silicon Valley.*

OS THERAPY

Windows Tips Because I Love You

Let's get naughty and lock down our PCs!

Peter Matthews, Mr. Nice Guy

Ahoy-hoy! My name is Peter Matthews, and I am happy—nay, *honored*—to be serving as your OS therapist for the next eight to twelve months. My twin brother Richard has been relocated to the Hartford field office for his involvement in the "Britney Screensaver Incident," and I have agreed to nurture this Windows column in his stead. *More noble shoes I could not hope to fill.*

Full disclosure, because you deserve nothing less: I am not an MCSE. In fact, I'm not even a computer "geek" (I'm still not comfortable using that word, but Richard assures me it's a term of endearment). But I am a board-certified aromatherapist, and a darn quick learner, and by the grace of the Goddess, I'll learn just as much from you, as you will from me. *This earthly journey, we will walk together.*

This month's empowerment exercise involves Windows XP's Fast User Switching, one cutie-petutie of a feature that lets two WinXP users switch between their profiles without logging off. The problem with Fast User Switching is that you give up almost all of the OS's delicious security features when you turn it on. Shame on you, WinXP! Shame, shame, double-shame! We'll just have to fix your little bug and fast.

First, right-click on your desktop, go to New, then Shortcut. Type `rundll32.exeuser32.dll,LockWorkStation`, then press Next. Give your shortcut a clever name, such as Lock My PC, then right-click on your new shortcut, and go to Properties. Click in the "Shortcut key" field, then press the shortcut you want to use to lock your PC. I used Ctrl-Alt-L.

After you've created your shortcut, you need to make sure the account you want to protect actually has a password. Press your Lock My PC keyboard shortcut, then click on your username. If it prompts you for a password, you're in great shape! If not, you'll need to go back into Windows, open the Start Menu, go to the Control Panel, and click User Accounts. Click Change an Account, then select your account. Go to Create a Password and follow the instructions.

Now, anytime you need to lock down your PC, all you need to do is press your shortcut. That's it until next month. *Fare thee well!*

New Celeron Uses P4 Core

Intel's budget Celeron chip received a major boost this spring when the company announced a 1.7GHz version using Pentium 4 technology. The 1.7GHz Celeron fits in Socket 478—just like the P4—and has full SSE and SSE2 support.

To keep the Celeron cheap, the chip will use the older 0.18-micron process of the Willamette P4, not the more advanced 0.13-micron process used in the Northwood P4. The Cellie will also be limited to a 400MHz bus, as opposed to the faster 533MHz bus of the high-flying P4, and will feature just 128K of L2 cache. The Willamette boasts 256K, while the Northwood boasts 512K.

Oddly, a 1.4MHz Celeron based on the Pentium III core will use Socket 370 and the more advanced 0.13-micron process, and come with 256K of L2 cache. The rub is that its bus speed will be just 100MHz.

Bulk pricing will be $83 for the 1.7GHz, and $86 for the 1.4GHz.

FUN-SIZE NEWS

Cheetahs Get Fatter

Seagate has upped the ante in the high-performance SCSI market with what it says are the two largest drives in their class. Seagate has doubled the size of its 15,000rpm SCSI Cheetah drive to 73GB. The company says the Cheetah 15K.3's higher density and spindle speeds give it 35 percent more I/O and 29 percent faster minimum sustained transfer rates than 10,000rpm drives. The company also pushed its 10,000rpm Cheetah 10K.6 up to a whopping 146GB. The 73GB drive retails for $939, while the 146GB is listed at $1,249.

AMD Names Its Big Boy

Opteron—that will be the name of AMD's eighth-generation 64-bit CPU. Derived from the Latin word optimus or "best," Opteron is intended to suggest reliability and strength. The CPU will be used for the 2P and 4P versions of the Hammer CPU that will be introduced next. The Opteron name will not replace Athlon. AMD says it still has plans to introduce an x86-64 CPU that will use the Athlon name later this year.

NASA Forages for Old PC Parts

A 21-year-old 8086 computer may be worthless to you, but NASA might be able to use it for the space race. The Administration's propeller beanies have been scrounging online auction sites such as eBay and Yahoo for old computer parts to keep their fleet of space shuttles running, according to the *New York Times*. The old CPUs are used in components that test boosters. Other parts such as floppy drives and motherboards are also in high demand at NASA. The parts were high-tech when the shuttle was first designed and flown in 1981, but have since fallen behind the power curve of today's electronics.

Biometrics Faked Out

So much for fingerprint security. A Japanese researcher says he has been able to circumvent biometric fingerprint readers using a finger made out of gelatin. Tsutomo Matsumoto, a graduate student at Yokohama National University, says he was able to crack 11 different fingerprint security devices 80 percent of the time using the fake finger. The student was even able to lift fingerprints from glass and attach those to the fake finger.

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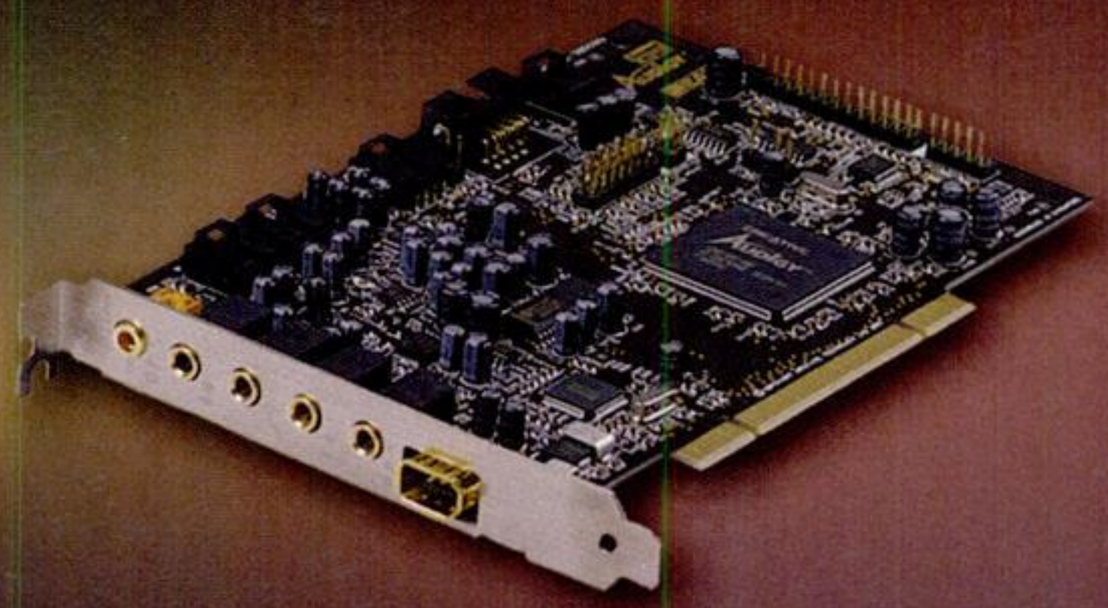

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GEAR OF THE YEAR MAXIMUM PC

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Not Much Ado about Morrowind

Ever play a game for 10 hours and *still* not been sure if you really like it? It doesn't happen often, but it does happen, and almost exclusively with role-playing games. *Morrowind* is a current case in point. It's a long game. Huge. Epic. The *Berlin Alexanderplatz* of RPGs. Exploring every one of its little butter-filled nooks and crannies will probably take more than 60 hours. It has an elaborate character generation system, a mass of quests and side quests, and a host of non-player characters. Hold on a minute while I check the *MS Word* Thesaurus for some more "big" words: great, vast, hefty, bulky, out-sized, pleasantly plump, zaftig, and so on and so forth. You get the idea.

So, no surprise that it takes some time to get a bead on its quality level. But my level of ambivalence is a little surprising given *Morrowind*'s many virtues. The game is rich in incident and plot, loaded with inventive visual style, and truly evocative of a fantasy world.

But, to start with, the game has a pretty basic problem: walking. Traveling through the world is mysteriously slow. I thought maybe I was having some system problems or perhaps had accidentally generated a character who scooted around the world strapped to a plywood dolly. No, the game itself simply moves like a snail through molasses. Then I discovered I had actually been *running* the whole time. When I disabled the running option, I moved *even slower*. I'm not kidding when I say that my speed would have to be measured by the people who track glacial shifts. And this is in, as I've already overstated, a *really huge gameworld*.

And there's an even bigger problem. *Morrowind* offers a remarkably fresh and deep character generation system, with many classes and much fine-tuning. Yet you can pick just one, and you spend the next four or five dozen hours stuck with that one character. The idea of traveling solo through a world with so many challenges and so much complexity is simply ludicrous.

I could make the argument that solo RPGs aren't RPGs at all, but merely lavish action or hybrid action/adventure games. I could, but I won't, because I need letters from RPG fans like I need toe fungus. Even a story that focuses on a single character can be a party-based adventure. Parties would also bring balance, interest, and diversity to the fairly pedestrian combat system.

***Morrowind* is impressive, no question. But even after many hours and numerous NPC conversations, I find it a curiously inert and empty experience. Maybe by this time next month I'll have come around, but only if my High-Elf Rogue manages to kill somebody and steal his Nikes.**

Tom McDonald has been covering games for countless magazines and newspapers for 11 years. He lives in the New Jersey Pine Barrens.

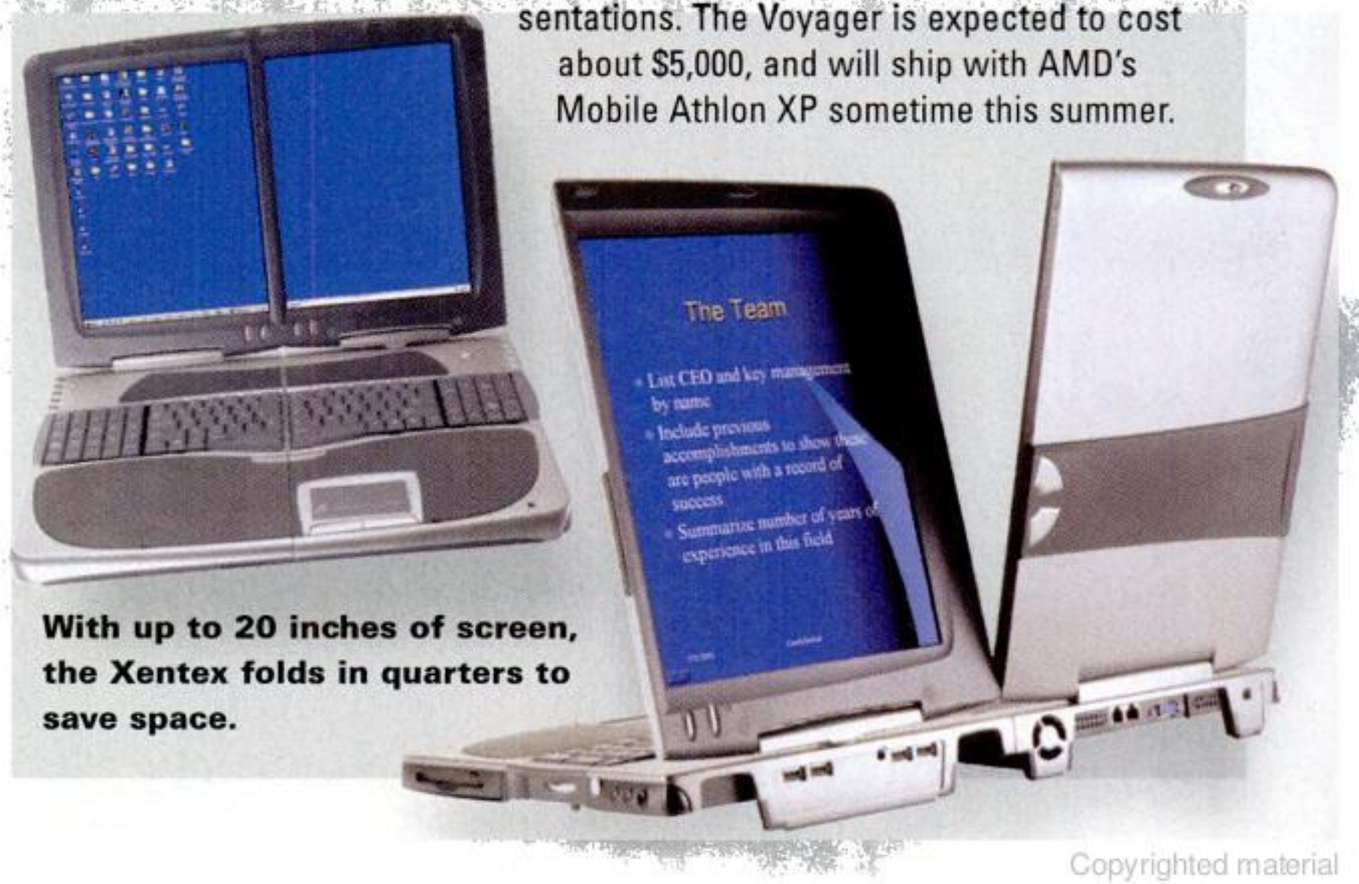
Robot Fun for All Ages

If you thought Lego MindStorms were a little advanced for your little one's learning curve, you may want to check out the company's new Spybotics toy robots. Aimed at a younger crowd, the Spybotics demand much less assembly time. This is good news for all the adults who had to take over MindStorm construction projects after the kids gave up.

Here's how Spybotics work. You cable your robot into your PC's serial port. Now fire up the bundled Spybotics software, and create a mission objective for the robot to complete—the harder the mission, the more points you'll earn. The mission parameters are downloaded into your robot and you're ready to roll. Now place the robot on the floor, and steer it through a maze of imaginary bolts of electricity, lasers, and other obstacles. Each completed mission generates a score, which can then be uploaded to the Spybotics web site for gloating purposes. Kids can play single-player or against a friend, and download new missions from the web as well. The four robots—each with its own unique speed, traction, and gripping abilities—are expected to sell for $60.

You Gotta Know When to Fold'em

Call it notebook origami: Xentex's new Flip-Pad Voyager notebook literally folds in half to save space. When folded in, the Xentex is about the size of a traditional desktop replacement notebook. When unfolded, the Xentex gives you a 20-inch screen and an extended keyboard with a numeric keypad and separate function keys. The screens are supported as dual monitors, and can be flipped around 180 degrees during business presentations. The Voyager is expected to cost about $5,000, and will ship with AMD's Mobile Athlon XP sometime this summer.



With up to 20 inches of screen, the Xentex folds in quarters to save space.

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Head2Head

A showdown among natural competitors

THIS MONTH: Palm vs. Pocket PC

Palm OS vs. Pocket PC—it's the tech geek's version of the old Ford-Chevy debate. And if you're a true PDA fanatic, you probably vote along party lines. Always have, always will. But isn't it possible you're missing something? Isn't it time to take a second look at the enemy camp?

For our showdown, we picked two of the niftiest devices in each class. Sony's Clie PEG-NR70 represents the Palm OS platform. Quite possibly the coolest Palm device ever, the Clie oozes sex appeal. For the Pocket PC 2002 camp, we grabbed HP's 568 Jornada. The looming Compaq-HP merger will eventually kill the Jornada line, but HP says "the best of the current HP Jornada technology will be engineered into the [Compaq] iPaq." Let's hope so! The Jornada has some key features that make it one of the best Pocket PC units on the market.

—GORDON MAH UNG

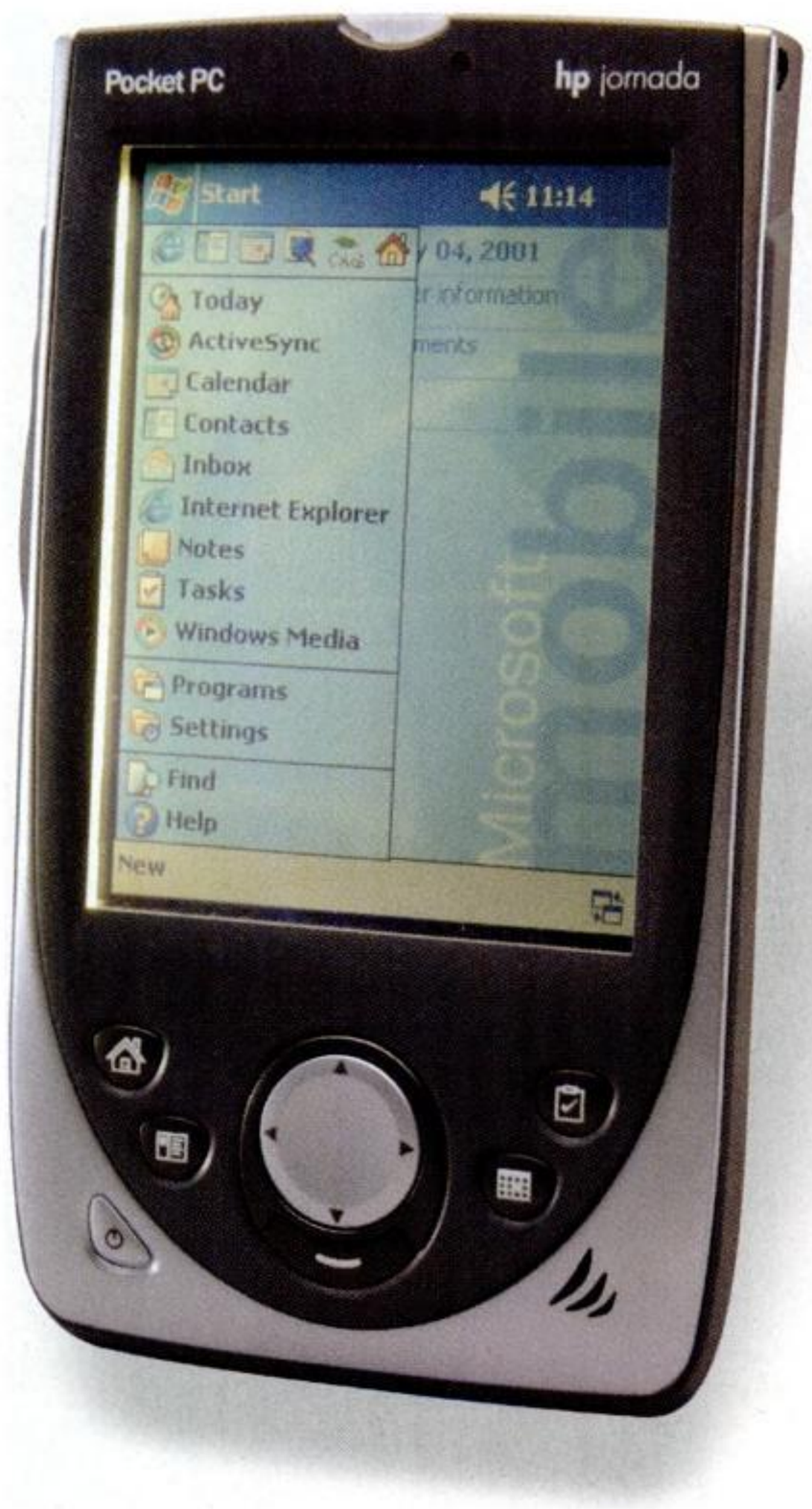
HEWLETT PACKARD JORNADA 568 Verdict: 8, $600, www.hp.com

CPU: If you think your Palm doesn't need a faster CPU, try viewing an Acrobat file on it. Now try it on a Pocket PC 2002 device. Yeah, we thought so. CPUs matter, even in handhelds. Packing a 206MHz StrongARM, the Jornada gives you a nice, crisp mobile PC experience. Videos and scrolling maps are also rendered much better on the Jornada, thanks to the hefty proc. **Winner: Jornada**

MEMORY: We can't help but use the Acrobat analogy again. How many times have you downloaded a large PDF file to view on the train ride home? With 64MB of RAM, even the heftiest PDF is easy to handle on the Jornada. That just can't be said of the 16MB Sony Clie. Pocket PC apps certainly demand more memory than do Palm apps, but the memory is put to great use. **Winner: Jornada**

EXPANSION: Many Pocket PC vendors are moving lemming-like to the Secure Digital cards that Palm adopted with its M500 series. Suckers. SD/MMC is supposed to suck less power than Compact Flash, but still hasn't matched its utility. The Jornada ships with a CF slot, which can play host to 1GB memory cards, modems, LAN cards, and even Wi-Fi cards. Compact Flash vs. Memory Stick isn't even a battle worth wasting space on, so let's just declare a winner. **Winner: Jornada**

OS: With Pocket PC 2002, Microsoft has finally turned the corner with mobile OSes. Because it runs on such hot hardware, and because it offers multitasking and customization, it's easy to see why the wee Microsoft OS is eating into Palm's market. All that said, it still requires firmware updates and patches galore—typical Microsoft service-pack drudgery. The Palm OS might have its drawbacks, but it's clean. **Winner: Clie**



SCREEN: The Jornada's 16-bit color screen runs at 240x320. Like the Clie, it can toggle between reflective mode (for outdoor use) and front-lighting (for indoor use). Text rendering is aided by the same ClearType technology that Microsoft uses in WinXP to make text less jaggy. You can hide the pen input area to give the Jornada a larger overall screen, but in the end, we were more enchanted by the Clie's awesome visual quality and resolution. We award this close one to Sony. **Winner: Clie**

INPUT INTERFACE: There's an abundance of ways to enter data into the Jornada: You've got a cursive mode; a block recognizer that's similar to Palm's Graffiti; a letter recognizer similar to Jot's CIC; and the ability to write on the screen directly. Clie's keyboard is great for people who never get the hang of stylus input, but the Jornada certainly offers greater stylus-based options. **Winner: Tie**

BATTERY LIFE: While many Pocket PCs claim eight hours of constant usage, the Jornada can run for 14 hours. The best part is the user-serviceable battery: If your battery can no longer hold a charge, you can swap it out yourself (every other PDA we've used requires battery servicing by the manufacturer, a lengthy and sometimes pricey process). During our MP3 run-down test, the Jornada lasted 7.5 hours—just like the Clie. **Winner: Tie**

AUDIO: The Jornada supports both MP3 and WMA using Windows Media Player 8.0, and its 1/8-inch jack lets you hook in any set of standard headphones (you can do the same with the Clie). Oddly, we found that the Jornada exhibited an occasional pop or pause when playing music while tinkering with other apps. We also found that the Clie had more volume than the Jornada. This battle was very close, but... **Winner: Clie**

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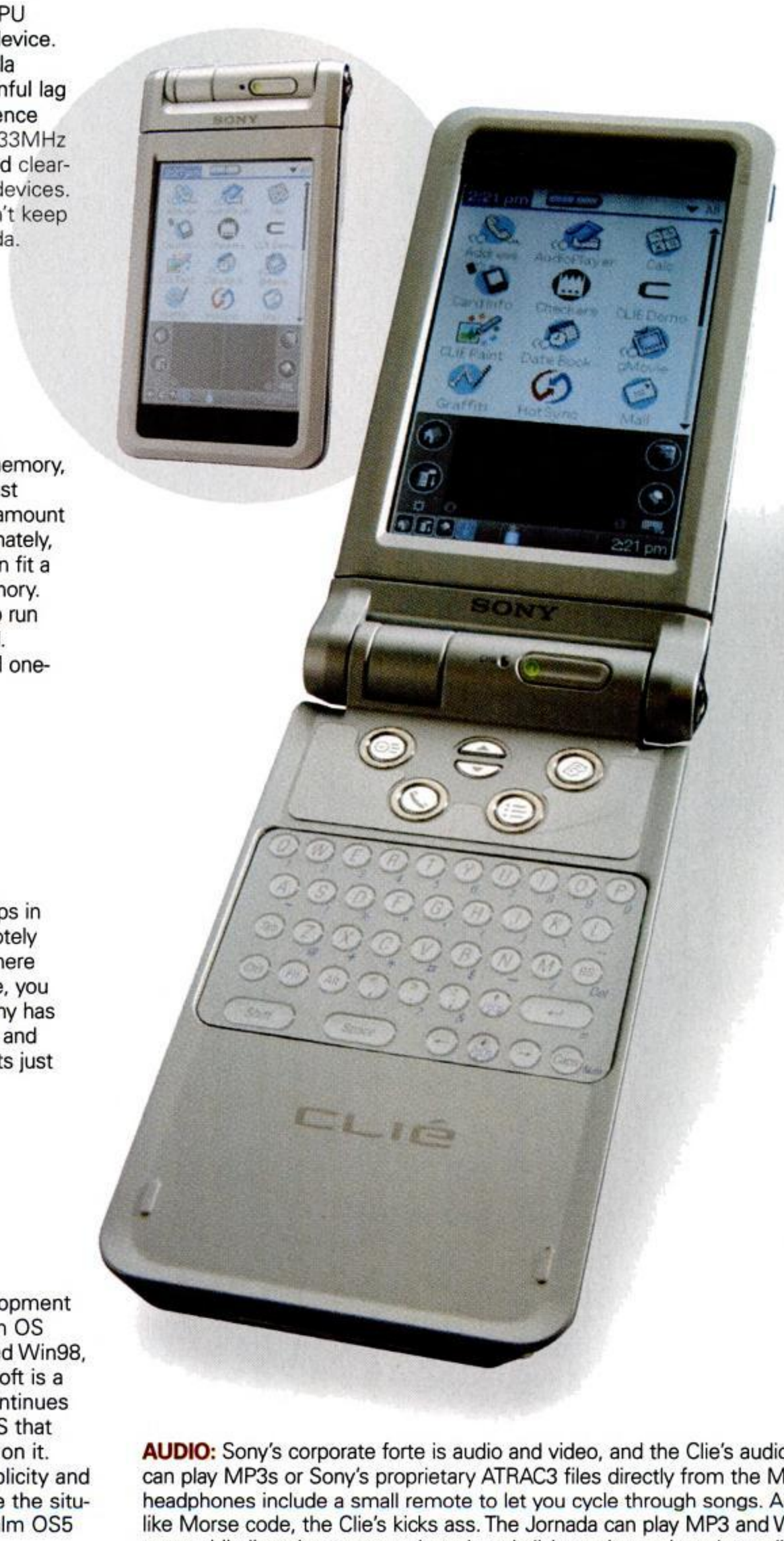
SONY CLIE PEG-NR70 Verdict: 9, $500, www.sony.com

CPU: The new Clie packs the fastest CPU we've ever seen in a Palm OS–based device. Humming along at 66MHz, the Motorola Dragonball Super VZ eliminates the painful lag that most Palm hardware users experience when moving from app to app. With a 33MHz advantage, the Clie just zings along, and clearly kicks the butts of all other Palm OS devices. That said, even the nifty Dragonball can't keep up with the 206MHz CPU in the Jornada. **Winner: Jornada**



MEMORY: A faster CPU means more memory, right? Sadly, no. The new Clie includes just 16MB, which is the maximum memory amount in all other top-shelf Palm devices. Fortunately, Palm apps are still teeny-tiny, and you can fit a generation of the suckers into main memory. And thanks to Palm OS 4.1, you can also run apps stored on your add-in memory card. Regardless, the Jornada's 64MB of RAM one-ups the Clie. **Winner: Jornada**

EXPANSION: Memory Stick support ships in seemingly every Sony device that's remotely tied to computing. Fine and dandy, but mere Memory Stick support isn't enough. Sure, you can get a Memory Stick camera, and Sony has long had plans for Stick-based GPS units and the like. But the PDA-appropriate products just haven't materialized. **Winner: Jornada**

OS: Let's put Palm's sluggish OS development into perspective: Since the original Palm OS debuted in 1996, Microsoft has launched Win98, 2000, Millennium, and XP—and Microsoft is a world-renown OS laggard! But Palm continues to shuffle along with the same basic OS that couldn't multitask if your life depended on it. Fortunately, the Palm OS excels at simplicity and stability, so this battle is a wash. Maybe the situation will change this summer when Palm OS5 arrives. **Winner: Tie**

SCREEN: The bright, high-res screens on Pocket PCs typically kick the crap out of Palm device screens. But Sony uses a 320x480 LCD that supports 16-bit color. It's gorgeous, and the high resolution eliminates much of the jagged characters that haunt lower-res PDAs. The front-lit screen also supports lit and reflective modes for use outdoors. Because the Clie uses a square screen (a portion of which is occupied by the virtual Graffiti area), there are none of the scaling problems that hurt other PDAs. **Winner: Clie**

INPUT INTERFACE: You can unfold the Clie to thumb-type on the keyboard, or flip the screen around and input Graffiti text with a stylus. Graffiti and Pocket PC 2002's Block Recognizer are pretty similar, but the keyboard is helpful for people who hate both. **Winner: Tie**

BATTERY LIFE: Sony doesn't publish a battery life spec because most Palm OS devices don't really have battery life problems—the modest but efficient CPU doesn't suck much juice. Nonetheless, we played MP3s nonstop on both units to see which would last longer, and both lasted 7.5 hours, give or take 60-odd seconds. Amazing. **Winner: Tie**

AUDIO: Sony's corporate forte is audio and video, and the Clie's audio is top-notch, as one would expect. You can play MP3s or Sony's proprietary ATRAC3 files directly from the Memory Stick. Even better, the bundled headphones include a small remote to let you cycle through songs. And while most Palm audio quality sounds like Morse code, the Clie's kicks ass. The Jornada can play MP3 and WMA files, but we found that using other apps while listening to songs introduced clicks and pops into the audio. **Winner: Clie**

THE UPSHOT

With Pocket PC 2002, Microsoft and its hardware partners have finally gotten within spitting distance of the Palm platform. And if not for innovations from companies like Sony, HandERA, and HandSpring, we don't think Palm would have made it this far. But PDA allegiance really comes down to personal preference, and at *Maximum PC*, we're still aligned with the Palm OS, if only by a razor-thin margin. As always: Your results may vary. ■

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Maximum PC takes a bite out of bad gear

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> Spammers

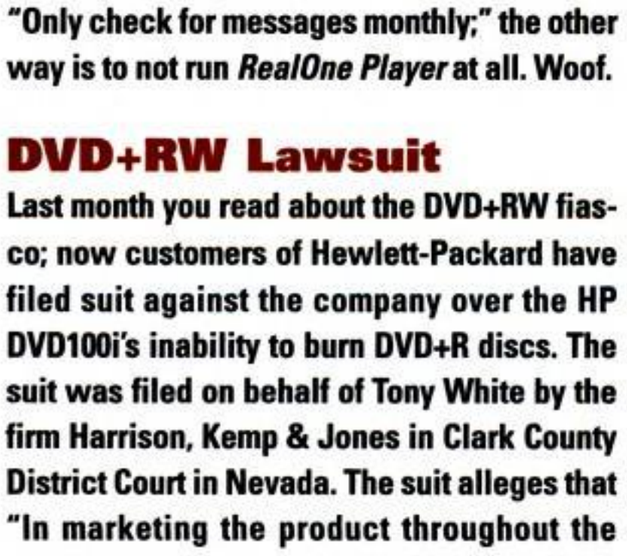
RealError and DVD+RW Fiasco Update

In the May 2002 issue of *Maximum PC*, The Dog addressed the convoluted language used to describe how to turn off the message center in *RealOne Player*. Unfortunately, the confusing language confused The Dog as well. To disable the message center when you're not using the *RealOne Player*, check "Only perform automatic services while *RealOne Player* is in use." The *RealOne Player* will read you the riot act, but it won't display the annoying message center popups when the program is not in use. Of course, the message center will still be active when you're using the player. There are really only two ways to keep the *RealOne* popups to a minimum. The first is to go into the message center's Delivery Preference section and select "Only check for messages monthly;" the other way is to not run *RealOne Player* at all. Woof.

DVD+RW Lawsuit

Last month you read about the DVD+RW fiasco; now customers of Hewlett-Packard have filed suit against the company over the HP DVD100i's inability to burn DVD+R discs. The suit was filed on behalf of Tony White by the firm Harrison, Kemp & Jones in Clark County District Court in Nevada. The suit alleges that "In marketing the product throughout the United States and Europe, [HP] repeatedly touted the DVD+RW as having DVD+R capability." The suit cites press releases on HP's web site that said the DVD100i would burn DVD+R, as well as similar statements on the DVD+RW Alliance web page.

The suit also states: "Prior to launching sales of the product, [HP] realized the product would never be compatible with the DVD+R format. Nevertheless, [HP] undertook no efforts to notify its customers or future customers of first-generation DVD+RW drives that their representations had proven untrue and that the product could not—and would not be able to—write to the less expensive DVD+R discs. Instead, after commencing sales of the product, [HP] simply and quietly purged the false representations as to the universal compatibility of the product."



The cops put the clinks on a Best Buy customer looking for a deal on this card.

HP officials declined to comment on the suit, saying they had not seen the suit. Meanwhile, HP has begun its $99 trade-in program for DVD100i owners. For a short period of time, HP will provide drives that can record to DVD+R to consumers who purchased retail-boxed DVD100i drives, or those who received the drives with systems. Visit www.hp.com for more information.

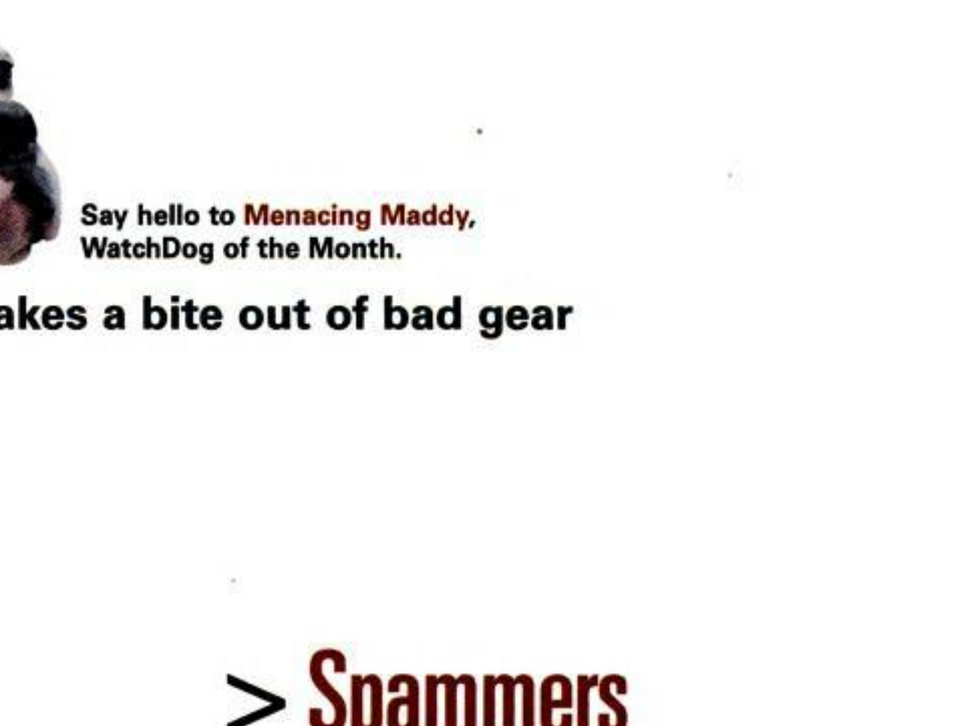
It Never Hurts to Ask?

In the April issue, we reported on a BestBuy.com pricing gaffe, wherein GeForce4 Ti 4600 cards were briefly offered online for $129 (they retail for $399). Upon realizing the mistake, BestBuy.com retracted the offer and cancelled all orders made at that price.

After hearing that other customers were able to price-match the $129 online deal at Best Buy stores, Cherian Abraham gave it a try by visiting a store in person. But instead of receiving the card at the discounted price, the 28-year-old software analyst found himself cuffed and taken downtown where he was braced by detectives. The charge? According to Dekalb County Police, Abraham was arrested for criminal trespassing. A Best Buy spokeswoman told The Dog that Abraham became disruptive in the store.

Abraham sees things differently. He told The Dog that he feels abused by Best Buy, and that all he wanted to know from the store manager was if Best Buy would match the price that the web site had originally offered the card for.

"All I wanted to hear from them was yes or no," Abraham says. He added that the manager of the store kept him in a waiting room while he checked to see if he could match the price. It wasn't until police showed up that Abraham knew there would be no price-matching that day.



To disable *RealOne Player*'s message center when you're not using the app, check the update box, don't uncheck it.

Rod Hill, the manager of the Best Buy store, would not return The Dog's calls, but a company spokeswoman responded on his behalf. "Best Buy strives to maintain a positive, nondisruptive shopping experience for all our customers, as well as for our employees. This situation is not about a price match, but about the disruptive behavior of this customer. We believe we acted reasonably in this situation," spokeswoman Donna Beadle told The Dog.

The 28-year-old software analyst found himself cuffed and taken downtown where he was braced by detectives.

But according to a Dekalb County police report obtained by The Dog, the arresting officer didn't note any "disruptive behavior" by

Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic The Dog on them by writing **watchdog@maximumpc.com**. The Dog promises to get to as many letters as possible, but only has four paws to work with.

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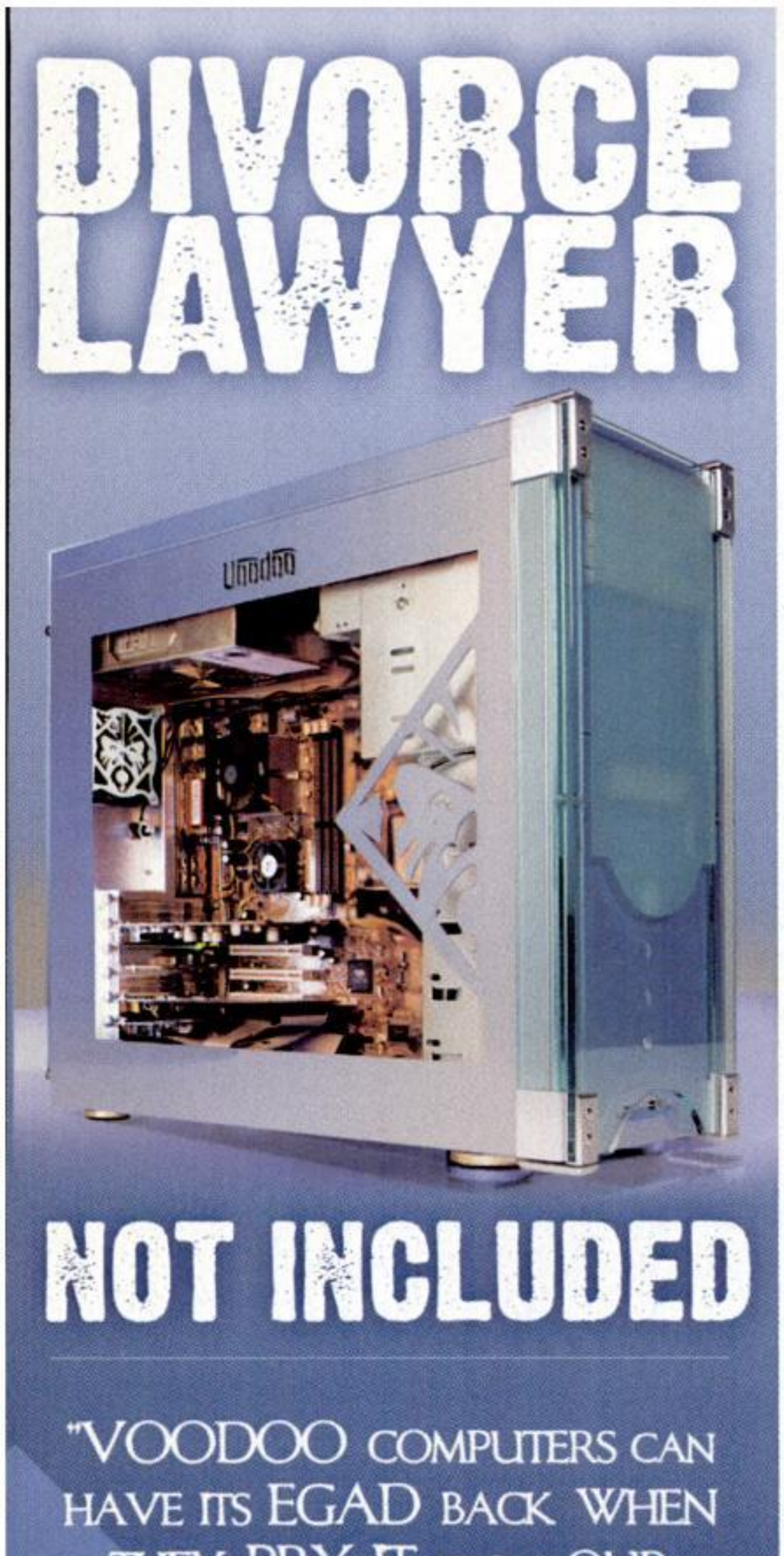


Consumer Advocate

Abraham, just a question of how much the videocard sold for. Officer Robinson wrote: "I spoke with complainant Rod Hill (General Manager) who stated that an unknown Indian male came in the store with a web site–generated receipt to purchase a $399 item for the price of $129.99. Mr. Hill advised that the computer-generated receipt was false because BestBuy.com receipt for the GeForce4 Ti 4600 is on the Internet for price of $399 and has never been listed for $129."

Of course, this isn't true. Best Buy did make a boo-boo by listing the card for $129, but corrected its mistake and offered to make amends by offering a coupon to people like Abraham who had ordered the card at a lower price.

One might assume that detectives believed Abraham, because he was released without being charged. Abraham says he's still waiting for an apology but doesn't expect it. Even more upsetting to Abraham is that Best Buy is apparently selectively honoring the web price at some stores. According to a report on the gaming web site Hypothermia, some 150 people have purchased the card at the lower price.

Of course, not everyone is sympathetic to people who are still trying to get their GeForce4 cards from Best Buy. Read on...

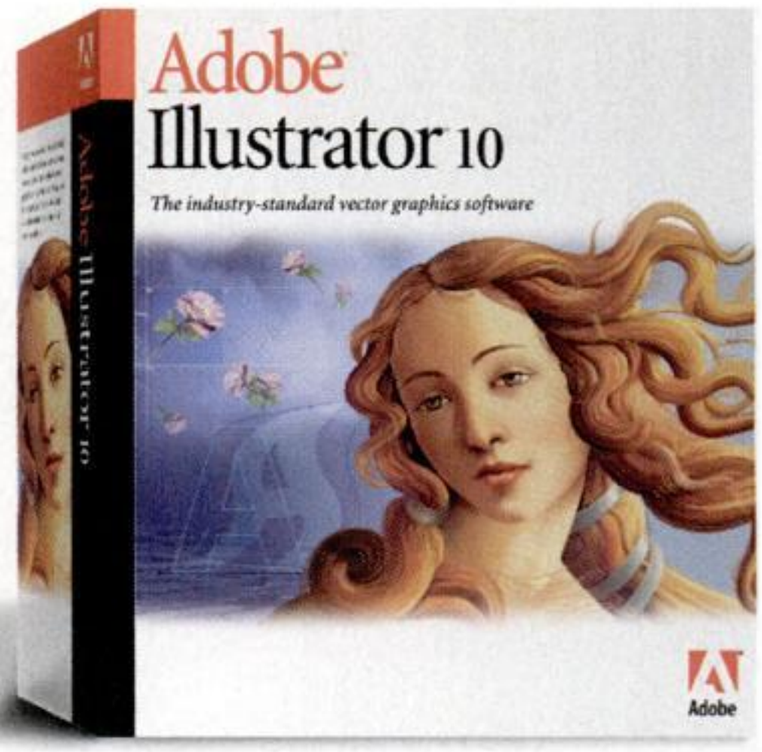
DEAR DOG: After reading the Best Buy hash scooped up in the April issue, I just had to respond. I guess my feelings come from only one area—common sense. Does the reader who wrote in really think this was not a mistake? And when finding out, was he so hurt that only whining would calm his desire for the über card? I cannot understand why the word "no" causes such trauma to folks; I can only ask this: Can any one of the 1,800 people who tried to buy the card for $129.99 say they've never made a mistake? If they have not, they should apply for positions in data entry, as I am sure the person who put the information in the system could use some help with the thousands of entries put in daily.

— TYRONE EILER

If It's Too Good To Be True...

DEAR DOG: Last February I received an e-mail advertisement for a software deal that was too good to be true. Payment for merchandise was to be made through PayPal. I went to PayPal to check the seller's standing and found nothing derogatory. I also found that this seller had been registered with PayPal for a year and a half. I immediately made payment for this unbelievably priced item on February 26, 2002. Since that time, I have neither heard nor received anything from this seller. I have contacted PayPal to see if this company is still in existence and was told to read the privacy policy. Three e-mails have been sent to the listed address with no replies. I cannot find the company listed with Yahoo. What's next? Where did I go wrong? But most of all, can you help me?

— WALTER E. BIALIK



Software manufacturers rarely discount $4,000 worth of new software for $39.

THE DOG RESPONDS: Walter's case is a perfect example of the age-old adage: If it's too good to be true, it probably is. In fact, the original spam mail sent to Walter even posed that question:

"How can you sell this software so cheap? It seems too good to be true—is there a catch? There is no catch—the software versions that we sell are OEM (Original Equipment Manufacturer), which means you will receive the installation CDs only (they do not come in their original retail packing and do not include the manual). We do guarantee that all programs are the 100% full working retail versions—no demos or academic versions! When you order, you will receive all materials required for a complete installation—or your money back!"

Right. Who wouldn't want to buy Adobe's *Photoshop 6, Illustrator 10, Page Maker 7, Premiere 6, After Effects 5*, as well as *Go Live, In Design, Page Mill, Stream Line, Frame Maker*, and the newly released *Quark Xpress 5.0* for $39 total?

The Dog contacted both PayPal and Adobe about the offer Walter received. Julie Anderson, a spokeswoman with PayPal, says the company has already been alerted by other consumers about the offer, and that PayPal has frozen the account. Even though Walter's claim was filed after PayPal's grace period, Anderson says PayPal will issue a refund for the $39. Adobe officials say they're looking into the offer as well. Cynthia Navarro, manager for Adobe's investigations and anti-piracy enforcement, says they've seen a rash of scams asking consumers to send money to a PayPal account. Oftentimes, it's not even OEM copies, but CD-Rs containing pirated software.

All things considered, Walt, your first mistake was responding to spam. ■

"Last February I received an e-mail advertisement that was too good to be true."

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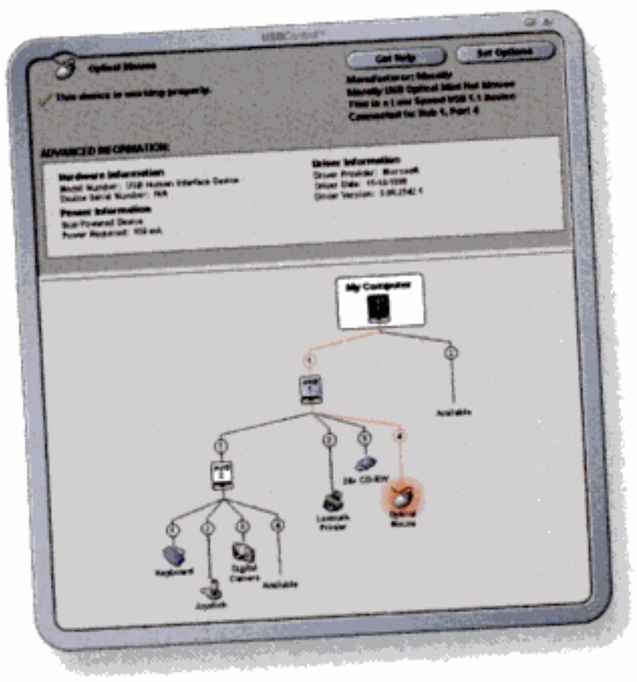
Ask the Doctor

Symptom → Diagnosis → Cure

Have a burning PC problem? How about a burning PC sensation? We're more than happy to help you with your PC problems, but you might want to get that sensation thing checked out by a qualified sensation checker-outer. If you have PC questions, send them to **doctor@maximumpc.com**. Just remember: We can't answer every e-mail. Oh, no—not by a long shot.



Adaptec's USBControl utility is a handy tool for USB 1.1 and 2.0 device diagnosis—but it only works if you've got an Adaptec USB card, natch.

OK, You're 'Old School'

Call me old school or something, but I prefer the two CD-ROM/CD-RW drive setup. I'll have none of this "one drive does it all" mumbo jumbo. My problem is that my CD-ROM vendor no longer supports or offers firmware updates for my Kenwood 72x. It's still the fastest CD-ROM drive that I've ever used or seen, but now it sometimes can't even recognize certain new game discs (such as *Jedi Knight 2*).

What CD-ROM drive do you suggest I pair with my Plextor 16/12/40A? Sure, I can just go out and get a generic 52x CD-ROM drive for $20, but that's not my style. I want the best ATAPI CD-ROM drive I can get that's still supported by the manufacturer on newer OS platforms.

—JOE "CYPRINIOUS" CARPIO

True X—for those who missed it—achieved hurricane-like speeds by splitting the laser into seven discrete beams for simultaneous reading.

There are still a lot of fans like yourself extolling the virtues of the True X technology used in Kenwood's 72x CD-ROM drives. Those fans are generally the people for whom the notoriously unreliable drives initially worked. True X—for those who missed it—achieved hurricane-like speeds by splitting the laser into seven discrete beams for simultaneous reading.

But now that CD-RW drives are routinely able to read at 40x and above without any shaky beam-splitting technology, Kenwood, and just about every other manufacturer, is distancing itself from this technology and the drives that use it.

If buying a cheapo CD-ROM drive isn't your style, why bother with another CD-ROM drive at all? Other than the budget drives you see stacked at CompUSA, these drives are a dying breed.

You made no mention of having a DVD-ROM drive, so that's the Doctor's first upgrade recommendation. Pioneer's DVD-500M is replacing our current favorite, the DVD-116. The 500M offers up to 40x read speeds—just as fast as the Plexy you've got.

Or you might consider upgrading your burner and using the Plextor as your reader. The newest drives, like TDK's VeloCD 40x (reviewed on page 64), now sport read and DAE (digital audio extraction) speeds of 48x!

Finally, how about a DVD burner, such as Pioneer's DVR-A04? Now that would really be showing some style.

USB Booting Never Works!

Why is it not possible to boot from USB?

—HEATH NIELSEN

It is possible to boot from USB, Heath, but your motherboard must support it. Unfortunately, only about 10 percent of motherboards we've seen do. Check your motherboard's documentation to see if it's capable of this. And if the documentation says no, check the BIOS updates on your mobo manufacturer's web site—the capability may have been added since you purchased your motherboard or system.

Is My USB 2.0 Up To Speed?

I am using an Asus P4B266 motherboard with onboard USB 2.0. I recently connected a Lava Kazan hard drive enclosure, which mates an IDE drive with a USB 2.0 port. Device Manager indicates that an Asustek controller is used, and Asus's web site provides Adaptec drivers for this controller. Am I right to assume that this is why Windows XP's update site won't install Microsoft's drivers? How can I test whether I have USB 2.0 speed? The stopwatch test hasn't worked for me.

—JACK STROM, M.D.

If you're not sure that you're getting USB 2.0 speed—which is 40 times faster than USB 1.1—then you probably aren't. That, or you aren't using a large enough file for the transfer to demonstrate a noticeable difference. For example, a 50MB file that takes a little more than a minute to transfer over USB 1.1 should take less than two seconds to transfer over USB 2.0.

First, try swapping some large files to see if you're getting USB 2.0 speeds. If the transfer is painfully slow, try uninstalling your USB 2.0 drivers and installing the latest version from Adaptec's web site (now at version 2.2). Microsoft also offers its own official USB 2.0 drivers at www.windowsupdate.com. (By the way, if you've already got USB 2.0 drivers installed, Windows Update won't try to override them with Microsoft's own.)

Finally, you might try unplugging all your other USB devices and testing your external drive again. Although the Doctor hasn't observed the phenomenon himself, he's heard of some USB 1.1 devices that drag everything down on their USB channel to USB 1.1 speeds. If you suddenly get the fast throughput you expect, use the classic process of elimination to find the offending device.

Adaptec offers on its web site a handy utility for gauging the performance of your USB 1.1 and USB 2.0 devices. Go to www.adaptec.com and search for the "USB Control Utility." This software is only intended to work with Adaptec hardware, though, so everyone else is outta luck.

Slow-Ass Computer, Blazing-Fast Internet

I recently acquired cable Internet, but because I'm on an old 166MHz Pentium with 32MB of RAM, it disk-thrashes all the time, which results in my computer locking up. To fix the problem, I bought a PC100 SDRAM 128MB chip. I opened my case and attempted to put the chip in what I thought was a DIMM slot. It looks like it's an SDRAM compatible slot; it's 168 pins long like an SDRAM slot, but the chip will not fit in there! Upon further inspection of the slot, I found the word, "UDRAM." What the heck is

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UDRAM? I asked my A+ instructor, and she's never heard of it. Local computer stores can't help me either! What is UDRAM?

—GREG FEAGAN

The Doctor has never heard of UDRAM either, and without information about the chipset or motherboard manufacturers, it's almost impossible to render a complete diagnosis. The Doc suspects, however, that the manufacturer stamped the board as UDRAM to indicate "unbuffered DRAM." If you say the pin counts and keys match up with those of a standard 168-DIMM, it's actually possible the slot is just too tight. The tolerance and fit on a DIMM slot can be awfully snug, especially if it's a vintage motherboard. The Doctor advises you to consult your motherboard manual about what kind of memory it will take. If the board does indeed support a standard DIMM, don't assume you can jam a 512MB DIMM in there, as early chipsets weren't designed to handle the density of today's memory. If your manual tells you to buy a specific module, you should. And before you spend any more money on your 166MHz Pentium rig, consider building a new machine that will get you much more performance in the long run.

Is Rambus Ever Going to Get Faster?

How long until Rambus gets another speed bump? I want to buy a Pentium 4 motherboard, and I'm looking at the Asus P4TE, but I want to know if Rambus is going to make a speed jump soon. And is the Pentium 4 going to stay on a 100MHz (x4) FSB, or is it going to go to something faster soon? Thank you very much!

—CLINT LEWIS

Intel finally announced its intentions to support a 533MHz or 133MHz x 4 bus with the 850E chipset. This move may confuse a few people, though. While Intel will run a 533MHz frontside bus from the CPU to the chipset, the memory will remain dual-channel PC800 memory. Intel will accomplish this by running the memory asynchronously with the processor bus. Rambus's PC1066, which runs internally at 1066MHz, hasn't been picked up by Intel yet. Intel says it's a matter of resources and the lack of available PC1066 that's preventing it from qualifying the memory. (The Doctor suspects there's also a healthy load of politics at work.) Even though Intel hasn't adopted PC1066, motherboard makers have already started offering it as a feature. Iwill's P4R533 (previewed in the June issue of *Maximum PC*) will run PC1066 memory with the 850E chipset. Even though PC1066 has been fabbed, it's not going to be officially supported in Intel's 850E chipset, at least for the time being.

Home Page Hijacking

A co-worker was looking at some adult sites, and one of them managed to change his home page to its own site. Since then, he's been unable to change it back. And no, it was not me. I was wondering how a web site can do this.

—JOHN "BARNEY" BAUERNHUBER

There are a number of ways that a scurrilous web site can change your home page, but as far as we know, there's only one way to do it as persistently as you describe—with a virus. By placing a small file on the PC, most likely with the extension .hta, every time you start up *Internet Explorer*, your home page is replaced with another page.

There are a few things your "co-worker" can do to prevent this from happening in the future. Make sure you are using the very latest version of *IE* and update it frequently at www.windowsupdate.com. Update your antivirus program, run a scan immediately, then run them periodically thereafter. Also, it's a good idea to lay off the porn.

Fanbus-o-Rama

You talked about using a fanbus to turn on and off at will the different fans inside your system. I have searched the web to purchase one and am unable to locate any. Please let me know of a source.

—BARRY WARNER

Plycon has a good selection of fanbuses, although they can get a little pricey. Check their web site at www.plycon.com.

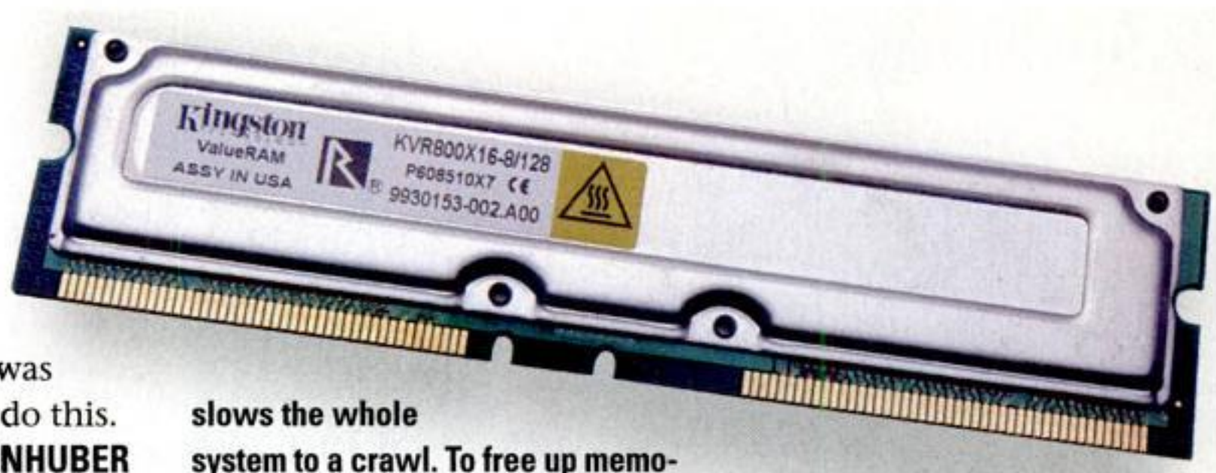
Hourglass Morass

My 733MHz Celeron system with 192MB of RAM has a problem. When I right click the desktop display to check Display Properties, it hangs and shows me only the hourglass instead of the display menu. If I right click the desktop icons, the context box is there instantly. I was wondering if there could be a problem with the Intel graphics adapter accessing memory, or something to that effect. Please help me keep my PC from mocking me.

—CLINTON HOLLINGSWORTH

PC slowdowns and hangs can be caused by a lot of different things. First, you should make sure you have the latest drivers for your motherboard chipset loaded from www.intel.com. (For non-Intel chipsets, see your motherboard manufacturer's site.) It's also a good idea to load the Intel Application Accelerator and Intel Graphics Driver. Then definitely defrag your hard drive.

Finally, you might have too many apps open, taking up precious system memory. If you run out of RAM, Windows will be forced to use the swapfile on your hard drive, which slows the whole system to a crawl. To free up memory, close any nonessential Taskbar apps and see if that gets rid of your hourglass woes.



Burned By the Burner

My father has a P-II 400MHz-based machine. Recently, he upgraded the CD burner to a TDK VeloCD 16x with Burn Proof. The problem is that he cannot packet-write a CD at more than 4x, nor can he copy a disc at more than 8x without the software (*Nero*) failing and burning a coaster. He has the CD-RW drive set as the master on the secondary IDE channel without any other devices on that channel.

Do you have any idea what might be going on?

—GLEN E. LUPHER JR.

It's hard to pinpoint what's going wrong here without knowing what operating system Dad's using, what specific error messages he's receiving, or whether the drive is internal or external. But we can't think of a better time to cover some of the basics of optical-drive triage.

Every time you start up Internet Explorer, your home page is replaced with another page.

First, check the minimum system requirements on the drive box. Ideally, this step should be taken in the store before you slap down the credit card. Dad's P-II 400 is no speed demon, but it more than meets the minimum requirements for the VeloCD 16x.

Second, unplug the IDE cable from both the drive and the motherboard, then reseat it firmly. Check the power cable going into the drive, and if you've got an external drive, reseat that cable as well. Believe it or not, this fixes most problems similar to the one your dad's experiencing.

Third, make sure you have at least 700MB free on your c: drive or, if you changed the location where *Nero* stores its temp files, then on the drive you specified. If you want to copy a disc but have only one burner, *Nero* needs to write the disc to a temporary image file on your hard drive. There are also a few rare instances in which *Nero* will create an image file of your disc before burning it (as opposed to on-the-fly copying, which does not do this).

Fourth, make sure the CD-RW drive is set as the master on its own IDE channel (in this case, separating the drive on its own IDE channel is important because it lets us know if anything else on the chain was giving the drive a problem). Your father did this, but one impor-

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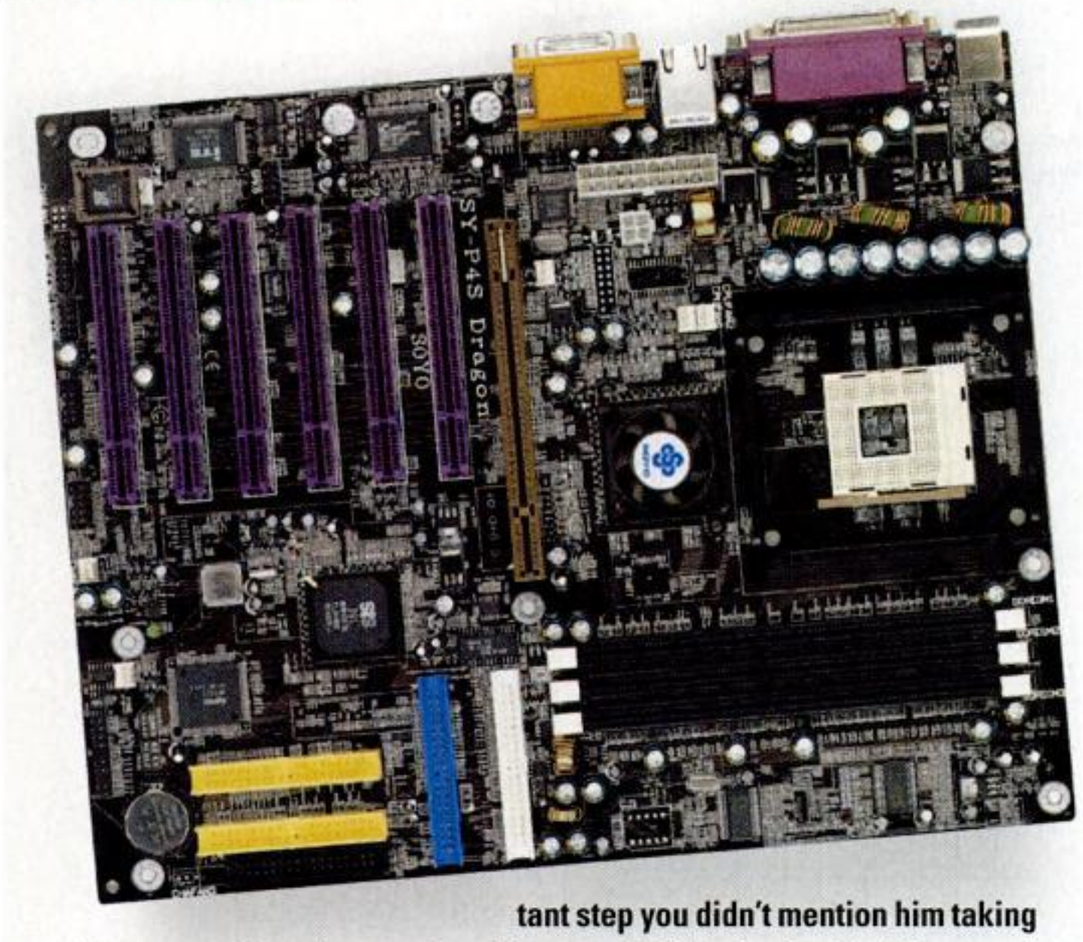

Because Soyo's SY-P4S Dragon uses a core logic chipset from SiS, driver support will come only from SiS, not Intel.

tant step you didn't mention him taking is making sure DMA is checked. In this respect, he's lucky to have a TDK drive—its documentation, which should be a model for the entire industry, explains how to do this.

Fifth, make sure your drive is using the latest firmware. At the very least, updated firmware will fix bugs and tighten performance. It may also add new features to your drive. Again, TDK's documentation provides clear instructions on this procedure.

Sixth, make sure your copy of *Nero* is updated (go to www.nero.com). Software updates, like firmware updates, can fix existing bugs while adding new features.

Finally, make sure you're using good media rated for burning at your burner's top speed, preferably from the list of recommended media included with your driver documentation. This is especially true of CD-RW media. If you want to rewrite at speeds above 4x with the VeloCD 16x, make sure your CD-RW media is "high-speed" media rated for 10x or above. If you are trying to use cheap 2x media, some burners will simply ratchet down the speed to prevent burning a useless coaster riddled with errors.

"The problem is that he cannot packet write a CD at more than 4x, nor can he copy a disc at more than 8x."

If you've done all this, and Dad's burner is still experiencing the same problems (that presumably didn't crop up with his old burner), then the drive is suspect and should be returned. It's a drag to rip it out and trot it back to the store, but think of it this way: Didn't we learn a lot today?

A Would-Be Flasher Needs Help

I just need to know how to boot my PC without running HIMEM or reinstalling Win9x/ME, so I can flash my BIOS. I am running Windows 2000, and when I go to format a floppy, there's no option to "Copy System Files."

—DMITRY DUNIN

The "Copy System Files" checkbox is not available under Windows 2000 because the minimum boot-up files won't fit on a floppy disk. If you were about to say "that bites," well, yes, it does.

The easiest workaround is to hop on your Segway and tilt over to the house of a friend who's got WinXP, WinME, or Win98. Format a floppy disk with the "Copy System Files" option checked, and test it before you leave. Under WinXP, all you need to do is insert a floppy disk into the drive, select the floppy drive within My Computer, then go to the File menu and click Format. In the Format options, click "Create an MS-DOS startup disk."

Intel's Not Supporting My Non-Intel Product!

I know that Intel has an application accelerator for its chipsets. I have a Pentium 4 Northwood on a Soyo Dragon P4S Ultra motherboard using the SiS 645 chipset. Is the application accelerator compatible with the SiS Pentium 4 chipset? If not, do you know if Intel ever plans on including this in the compatibility list, since it is not a dreaded member of the P4X266 series?

—BRANDON KIMLEY

While it's always difficult to determine Intel's stance on third-party vendors, the Doc is 99.9 percent sure Intel will never support any SiS chipset with its Application Accelerator. The Application Accelerator is written specifically for Intel's own ICH-series of I/O controllers that began shipping with the 800-series chipsets. There's quite a world of difference between SiS's 645 and 648DX chipset and Intel's own. Even though SiS has a license to use the Pentium 4 NetBurst bus, its chipset is nonetheless unique. Expecting Intel to develop a driver for an SiS chipset is like expecting nVidia to write drivers for ATI or Matrox. It just isn't going to happen.

Online Player Gets Counter-Struck

I am in deep crap. At least I think so. I went to a *Counter-Strike* game server and got frustrated with the administrator of the server (who was present on the server at the time). I got into an argument with him, and things got ugly. He threatened to ban me from the server and "screw with my settings." Soon after I got this message, I left the server in a panic. Later that day, *Counter-Strike* started freezing and crashing every time I got to the "Play Online" menu. Then I tried using the Maximum CD from your magazine, and none of the programs on it worked—they all crashed. Did the admin really mess up my computer? Or is my computer a piece of crap? I am in desperate need of help.

—SAM WESTERFELD

The Doctor loves a good whodunit. But he doubts that the *Counter-Strike* administrator is the perp here. Yes, he *might* have hacked through your firewall, gone into your PC, nabbed your passwords, stolen your identity, and deleted a few choice files here and there. But it's more likely that you just need to uninstall and reinstall *Counter-Strike*. You're the victim of an odd coincidence. ■

READER TIPS

Occasionally the Doctor gets an awesome tip from a reader, via either our online forums (www.maximumpc.com) or e-mail. If you've got a great tip, send an e-mail to *doctor@maximumpc.com* with the subject "Reader Tip." Be sure to include your name and phone number. The best ones will be printed in future issues.

Dust-Bunnies

I felt compelled to write in response to your advice to Mark Chambers regarding his dust-bunny problem. The use of canned air or a vacuum are the only really viable options. To use an actual air compressor would be a serious mistake, as most compressor manufacturers do not incorporate any type of water filter on the output of the air line. I know your remark about the home compressor was just a small part of your response, and I may be a little anal, but your dedicated readers are mostly overachieving users or gaming fanatics who follow your every word like religious separatists. If I can save even one poor bastard his/her PC from certain death caused by airborne water droplets, then my paltry contribution be worthwhile.

—DUSTYN E. JOHN

You're absolutely right, Dustyn.

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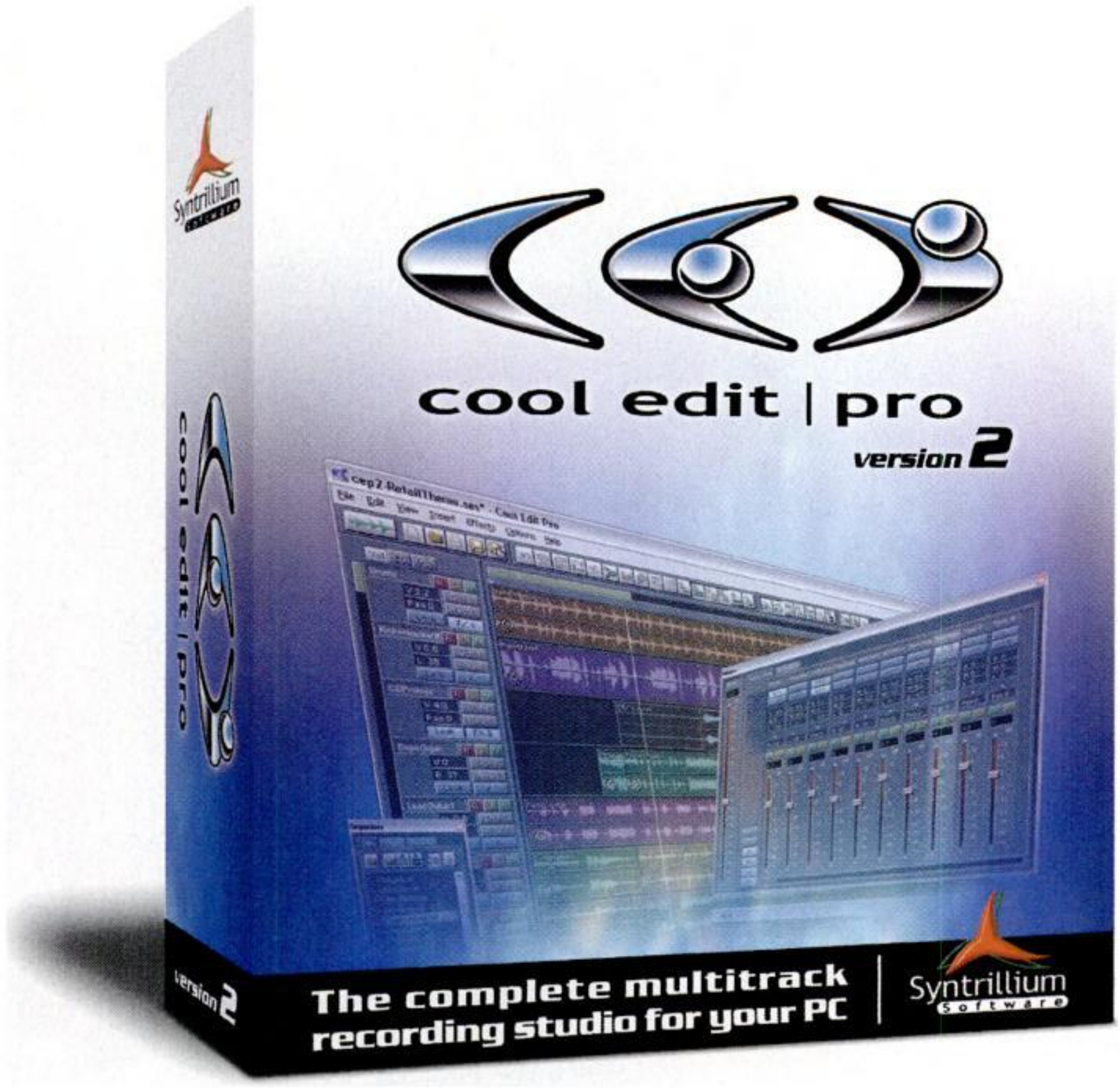

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Matrox Strikes

How the Parhelia videocard plans to rule the universe with new 3D effects, sublime visual quality, and the most immersive gaming ever

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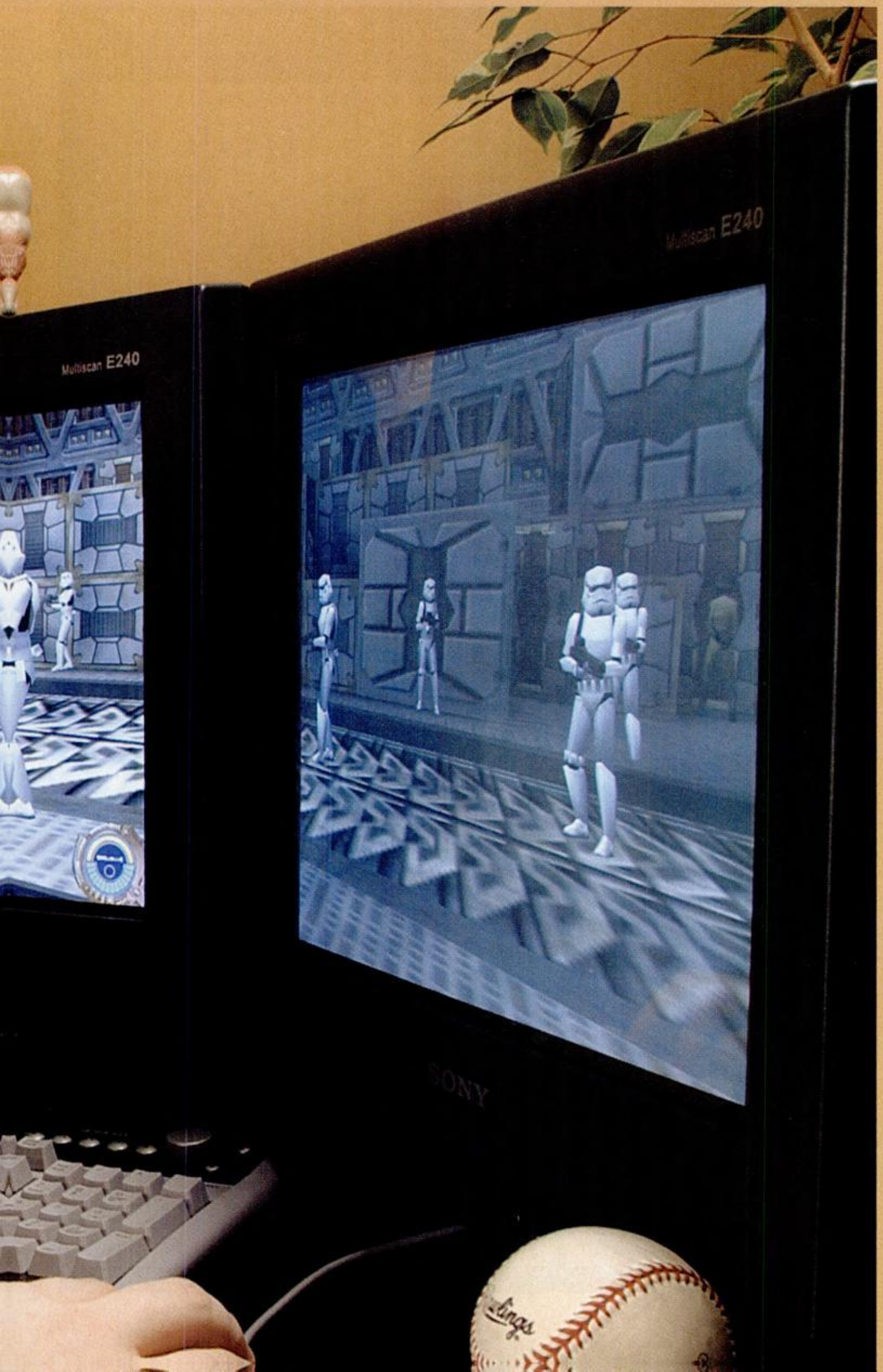


BY WILL SMITH

Matrox's new videocard—the company's first significant release since 1999's G400—might best be interpreted as a challenge to end the frame rate madness. In fact, the scrappy Canadian company is almost *daring* gamers to reevaluate what they value in a videocard: You can already play today's most intense 3D games at blazing-fast speeds imperceptible to the human eye, so do you really need yet another graphics processor that just raises the obscene performance bar higher?

Why not, instead, focus on bold new features that might actually make a tangible difference? We'll give you your frame rates, sure, but we'll also dedicate a good portion of our circuitry to anti-aliasing, filtering, color quality, and triple-monitor support—triple-monitor support that provides the most immersive 3D gaming you've ever experienced.

That's more or less the Matrox challenge, and if nothing else, it injects some much-needed drama into the current 3D horse race. ATI–nVidia hissy fits have grown tiresome. It's time for a third company to triangulate the competitive dynamic.

The Matrox Parhelia is an 80 million transistor, 512-bit GPU on a 0.15-micron process. That's a lot of transistors (the nVidia GeForce4 boasts around 60 million) and a very wide path for your graphics info to flow through. The Parhelia also uses 256-bit DDR SDRAM instead of the usual 128-bit memory. This means that compared with the GeForce4's memory, the Parhelia's memory can transfer twice as much data back and forth to the GPU per clock cycle. The Parhelia is also the first chip we've seen to support DirectX 9 features—DirectX 9–compliant vertex shaders and hardware support for displacement maps, to be precise.

So what's the rub? Clock speed, Spanky. It really comes down to clock speed. Eighty million transistors on a

MATROX PARHELIA

KEY SPECS	KEY FEATURES
CORE SPEED 200-250MHz (our estimate)	■ Triple-monitor support
MEMORY TYPE 256-bit DDR SDRAM	■ Industry-leading memory bandwidth
MEMORY SPEED 300-325MHz (our estimate)	■ Four DX9 vertex shaders
TRANSISTORS 80 million	■ Hardware-accelerated displacement mapping
PROCESS 0.15-micron	■ 10-bit per channel color
	■ 16x AA you can use!

0.15 process will not make for the speediest core of all time. We had only four hours to play with an early beta part, so it would be reckless to comment on the Parhelia's ultimate performance potential. And as of press time, Matrox still wouldn't reveal how fast the chip might run. But even with our limited knowledge of process technology, we can comfortably assume that the Parhelia will hit somewhere in the neighborhood of 200MHz to 250MHz. This would ultimately give the chip sub-GeForce4 performance—though still quite playable frame rates—in intense games like *Jedi Outcast* and *Medal of Honor.* Luckily, however, thanks to the Parhelia's texturing prowess, gamers should still be able to turn on visual-quality aids without suffering a debilitating lag.

So, are gamers ready to plunk down extra cash for not only a new videocard but also two new displays? And even if Matrox can carve out a market for itself, will the Parhelia still be relevant when nVidia and ATI release new weapons this winter? And will the average person be able to actually perceive the visual quality improvements that Matrox is so proud of?

The Parhelia begs a lot of questions, some of which we'll hopefully be able to answer in a review next month. But for now let's take a look at the basic Parhelia technology, which is intriguing if not powerful.

Memory Bandwidth

To understand the Parhelia's memory bandwidth achievements, you have to understand the memory bandwidth bugaboo.

Memory bandwidth—actually, the lack thereof—has long been a performance bottleneck for 3D accelerators. Take the original GeForce chipset from nVidia: The transform-and-lighting engine on this venerable warhorse was able to draw a hell of a lot of polygons onscreen, but the card's memory bandwidth dramatically slowed the speed at which the GeForce could paint textures across all those triangles. Think about it: Even a relatively low scene resolution of 1024x768 entails more than 780,000 onscreen pixels, each of which must be accounted for by a texture. Those textures are stored in the 3D accelerator's memory, and are transferred to the graphics processing unit (GPU) before the final 3D scene can be displayed. Now, if the accelerator's memory pipeline isn't fast enough or wide enough to accommodate all that texture data, frame rates slow to a crawl.

So memory bandwidth must be increased, and the easiest way to do this is by using faster onboard memory with wider bit paths. Today, the best 3D accelerators from nVidia and ATI are capable of transferring two 128-bit chunks of data more than 300,000,000 times each second. The Parhelia, meanwhile, should be able to transfer two *256-bit chunks* of data 325,000,000 times a second (this equation assumes Matrox will be using 325MHz memory). The card's GPU will be married to 256-bit DDR SDRAM, and achieve a wicked 20.8GB/sec of memory

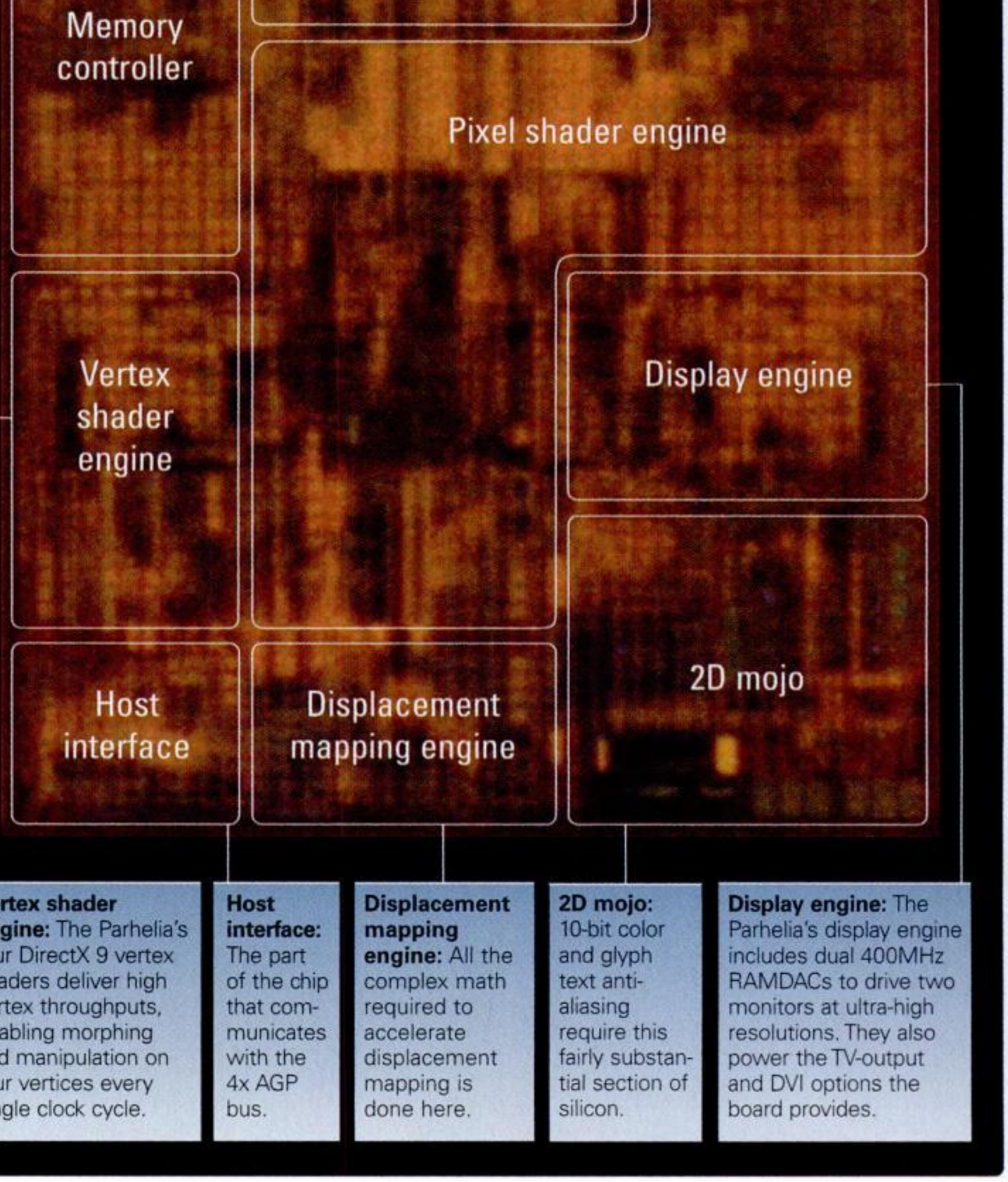
Inside the Parhelia-512

Buried deep beneath a heatsink, the secret core of the Parhelia lies. Behold as we unveil her secrets!

Memory controller: Forming the backbone of the rendering and display engine, this area provides multichanneled access to the Parhelia-512's frame buffer.

Anti-aliasing: By anti-aliasing only the edge pixels, the Parhelia offers hyper-efficient AA with support for supersampling FSAA as a fallback.

Pixel shader engine: The five-stage pixel shader engine on the Parhelia-512 is able to render realistic bump maps and other swanky shader effects. If that's not enough for you, the Parhelia's texture engine is able to apply four textures per clock cycle for each pixel that runs down its pike.



Vertex shader engine: The Parhelia's four DirectX 9 vertex shaders deliver high vertex throughputs, enabling morphing and manipulation on four vertices every single clock cycle.

Host interface: The part of the chip that communicates with the 4x AGP bus.

Displacement mapping engine: All the complex math required to accelerate displacement mapping is done here.

2D mojo: 10-bit color and glyph text anti-aliasing require this fairly substantial section of silicon.

Display engine: The Parhelia's display engine includes dual 400MHz RAMDACs to drive two monitors at ultra-high resolutions. They also power the TV-output and DVI options the board provides.

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bandwidth if Matrox's claims reach fruition (and they certainly should, because we suspect 300MHz will be the Parhelia's *slowest* memory speed). By comparison, the GeForce4 Ti 4600 employs 128-bit DDR running at 325MHz, which is good for a "paltry" 10.4GB/sec of bandwidth. Beginning to see why we're excited?

In addition to running the fastest memory pipeline on the market, the Parhelia uses some architectural tricks to juice every last drop of performance from its memory. Besides using multiple independent memory sub-controllers (similar to nVidia's Crossbar architecture), Matrox will integrate bandwidth-saving technologies such as fast Z-clears and large caches. All of the Parhelia's memory bandwidth can be used to accommodate the massive textures and complex vertex information that next year's highly complex 3D games will require. Or it can be used today to enable memory-intensive visual quality aids, such as anti-aliasing and anisotropic filtering.

Anti-Aliasing

Today's top games feature more detail than ever before, with thousands of polygons forming extremely realistic images of real-world environments. The problem is that when a scene includes lots of straight edges—for example, all the railings and ledges that you'd find in the interior of a factory—those edges look jagged instead of smooth, especially when in motion. These "jaggies" are aliasing artifacts. They interrupt straight edges and can even cause ugly shimmer in very complex scenes.

There are several anti-aliasing techniques used to get rid of jaggies, but the most common are super-sampling and multi-sampling. Super-sampling simply renders an entire 3D scene at a much higher resolution than what will ultimately be displayed onscreen, then scales down the scene for the final output resolution. The trick occurs during the scale-down process: The 3D accelerator uses a few of the "extra" pixels from the original, higher-resolution scene to smooth out jaggies for the final output. The downside is that this technique entails a lot of extra work just to remove a few jaggies.

How can the GPU avoid extra work? By working smarter. Instead of rendering an entire higher-resolution image in the manner described above, a multi-sampling system renders an image at its normal resolution along with extra "virtual" pixels that are used to smooth out the jagged edges of the base image. The drawback is that virtual pixels are created for every pixel on the screen. This is the GeForce4's strategy.

In the Parhelia, Matrox is introducing a whole new AA technique—fragment anti-aliasing—which takes multi-sampling a step further. Fragment AA renders virtual pixels to smooth out only the lines and edges that could potentially suffer from jaggies. Imagine, if you will, a beige box defined by black edges. Obviously, only the black edges would ever require AA. Where multi-sampling AA would create "virtual" pixels for not only the black edges but also for the beige interior, fragment AA would concern itself only with the black edges. The Parhelia avoids doing lots of extra work, and can actually parlay its performance savings into higher pixel sampling rates without punishing frame rate hits. Thus, you, the gamer, end up with better anti-aliased edges than ever before!

Like any other modern anti-aliasing solution, fragment AA will work with any 3D game. The game itself doesn't require any special coding, so all you need to do is set your AA level in the card's control panel. We had only about half a day to check visual quality on Matrox's beta board, but we were impressed with the quality of the anti-aliasing produced with 16x fragment AA.

Vertex Shaders

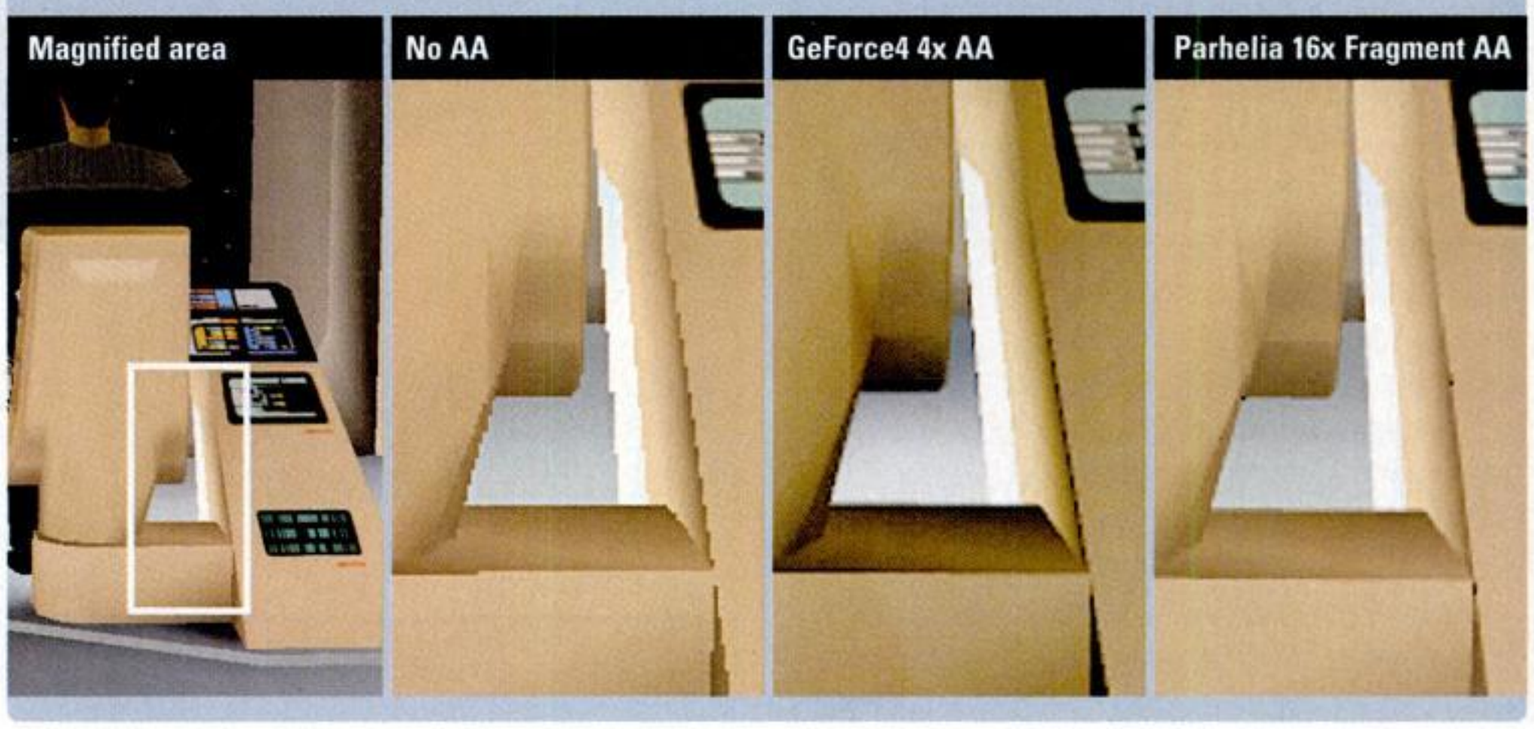
Every 3D environment is made up of thousands of tiny polygons, usually triangles. Whenever these triangles meet, they form a vertex. Vertex *shaders* are highly programmable processing units that execute small programs on any or all of the thousands of vertices. The result is an intense level of vertex manipulation that was never possible with fixed-function 3D accelerators like the original GeForce.

For example, to draw a waving field of wheat using a fixed-function accelerator, you need to create a 3D model for each and every stalk, then animate motion for each individual stalk model. For a large field, this would require an absolutely ludicrous amount of memory to contain all the necessary models. But a programmable vertex shader can create a much more convincing effect using just a few simple math shortcuts.

To wit: Since wheat stalks are virtually identical, it's easy to create one model, then cut and paste it thousands of times when the GPU is writing the image to its frame buffer. Animating the grass is even easier. Instead of creating keyframe ani-

Fragment AA: Stops Jaggies—Dead

The Parhelia's 16x fragment anti-aliasing really does look better than the 4x AA accomplished by competing 3D accelerators. Even better, Fragment AA doesn't slow performance any more than 2x AA does, and can be enabled in any 3D title you choose.



So What's a Parhelia?

Why pay millions of dollars to a branding firm when you can get your company founder to name the new videocard himself? That's right: Matrox honcho Lorne Trottier dubbed the new card "Parhelia," which is a "sun dog" by any other name. A parhelia is formed when light passes through ice crystals high in the atmosphere, forming a ring around the sun. Beautiful phenomenon, beautiful image quality. Makes sense to us.

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Third-Party Opinion

Here's some early scuttlebutt on the Parhelia's chances for success.

ON YIELD POTENTIAL AND MARKET POSITION...

Jon Peddie, of Jon Peddie Research, says the yield issue is a non-issue for the fab-less Matrox. Unlike Intel and AMD, which must eat the cost of poor yields, Matrox's contract puts the burden of low yields on the fab operator. Matrox and the operator will agree on goals, and it will be up to the operator to manufacture a certain number of chips at a particular frequency.

Peddie says Creative Labs and Matrox will be fighting for third-place in the consumer 3D market, and it's unlikely that either will knock ATI or nVidia from their leading positions. Both nVidia and ATI have development teams working in parallel. While one team is working on the next-gen core, a second team is working on the next-gen core's successor. Matrox, on the other hand, has just a single team, and for this reason, it will always be playing catch-up.

ON THE 80 MILLION TRANSISTOR PARHELIA CORE...

Peter N. Glaskowsky, editor-in-chief of the *Microprocessor Report*, says, "That sort of transistor count is certainly feasible in a 0.15-micron process. Manufacturing costs will nevertheless require the vendor to focus on high-end customers—professional users and gaming enthusiasts—willing to pay $300 or more for the card.

"Another key point is that the processing pipelines of graphics chips are very regular. All the texture units are the same, all the pixel pipelines are the same. A moderate amount of optimization can give these chips better overall transistor density than most ASICs ever achieve. Considering these two points, I think it's reasonable to expect the next generation of high-end graphics chips to sell for $40 to $50 each, or the equivalent value when sold as part of an add-in card."

NVIDIA ON SURROUND GAMING...

David Kirk, chief scientist at nVidia says, "[Surround gaming] is an interesting idea. I have two flat panels at my desk, but two CRTs wouldn't fit. I find it hard to believe that anyone would want to have three. Anything is possible, though. I don't see the advantage yet. It's also quite expensive. Getting three high-res flat-panels is expensive."

Vertex shaders: Polygons in Fluid Motion

The fins on this trigger fish are animated with vertex shaders. Both the movement of the fish's fins and the actual swimming motion that its tail makes are described programmatically. Without vertex shaders, the developer of this demo would have had to animate a repeating movement in a 3D modeling program by hand. When we saw this demo in action, we were awestruck by the fluidity and complexity of the fish's motion—but that's what vertex shaders can do for you. (Please note that this screen is not anti-aliased.)

mations for each and every stalk of grass, you can write a simple program that describes how the grass should move. As the scene is rendered, that program is run on all the vertices that make up the grass. The final effect is incredibly realistic and much less resource-intensive.

The Parhelia sports four DirectX 9 vertex shaders. Each of these shaders can manipulate one vertex per clock cycle. By comparison, the GeForce4 has just a pair of vertex shaders. The upshot should be that the Parhelia runs vertex programs twice as fast as a GeForce4—but this assumes that both chips are running the same speed core! By all estimations, the Parhelia will run a much slower core (200MHz to 250MHz as opposed to the GeForce4's 300MHz), so the chip's ultimate vertex prowess might only equal—or possibly even trail—the GeForce4. A lot of it depends on the complexity of a game's actual shader implementation, and only final benchmarks will tell.

Pixel Pipeline

Before we report on the Parhelia's pixel-pumping prowess, let's run through a pixel shader refresher course. Pixel shaders do for textures what vertex shaders do for polygons: offer game developers a much more efficient, customizable way to pull off 3D visual effects. In the few DirectX 8, pixel-shaded games we've seen, the most common pixel shader implementation has been in bump-mapping. A bump-mapped model employs an additional texture to impart the illusion of surface irregularities. For example, the dimples on a golf ball or the scales on a lizard could be rendered via bump-mapping. The technology can also be used to add realistic reflections (e.g., the light reflected from a ball of rolling mercury) and refractions (e.g., the "bent lighting" effect used to portray the baddie in *Predator*).

Bump-mapping is great, but DirectX 8 pixel shaders just aren't powerful enough to pull off particularly powerful effects. The truly amazing effects will be enabled by DirectX 9 games, which will be able to implement the 2.0 version of Microsoft's pixel shader spec (current DirectX 8 games use versions 1.0 through 1.3). The improved 2.0 shaders will allow developers to create, among other things, procedurally generated textures, which use space-saving techniques to pull off otherwise memory-intensive tricks.

Still with us? Good. Now let's talk operations per cycle. To conform to the upcoming DirectX 9 vertex shader spec, a 3D accelerator will need to be able to run a couple of hundred vertex operations each clock cycle—the Parhelia should be able to handle this with ease. To conform to the DirectX 9 pixel shader spec (that is, Pixel Shader 2.0), an accelerator will need to be able to run 64 pixel operations each clock cycle. This would appear to be a modest requirement, but the Parhelia won't comply.

There's really no disgrace in this, because pixel ops are a mother, and not even the GeForce4 has particularly robust pixel shaders. Please consider that while a detailed scene might have anywhere from 10,000 to 300,000 vertices, that same scene might potentially contain up

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to two million pixels. To perform a shader calculation for each one of those pixels just isn't feasible with today's hardware, so GPU developers have focused their attention on the much more achievable goal of creating vertex shaders that can provide tangible benefits.

All that said, the Parhelia's pixel pipeline is more flexible than the pipelines of other GPUs. While the GeForce4 can do up to 12 operations on a single pixel per clock cycle, the Parhelia can do nine operations on *four* pixels per clock cycle. (Operations are the simple mathematical functions, such as addition and multiplication, that make shaders tick). Although the actual number of ops-per-pixel is greater on the GeForce4 and the Radeon, those boards are only capable of running a single pixel through the pipeline at a time. The upshot is that in games that run simple shader programs, the Parhelia might be faster than either the GeForce4 or the Radeon 8500—only its slower core clock speed would lead to slower results.

Shader's aren't everything, and the rest of the Parhelia's pixel pipeline is interesting, too. For example, the GPU can render four quad-textured pixels **every cycle. Why develop a chip that** can render quad-textured pixels when most games require only dual-texturing? The answer lies in filtering. Support for hardware trilinear filtering, at little or no performance cost, has been a required feature in 3D accelerators since the nVidia TNT debuted. Trilinear filtering smoothes the transitions between mip-map levels, and smoothes textures to align properly on irregular shapes, but it's still not perfect. When a texture is applied to a surface that extends so far into the background that it tapers off to a point, trilinear filtering distorts that texture. This is where anisotropic filtering comes in. By taking samples from the different resolution textures stored in mip-maps, anisotropic filtering smoothes the transitions between mip-map levels even further.

So what does all this mean to the new Parhelia owner? It means better visual quality. The Parhelia should be able to run eight-sample anisotropic filtering on four dual-textured pixels per clock. In a game such as *Quake III Arena,* which requires only dual-textured pixels, you'll be able to turn on anisotropic filtering with minimal performance hit. Prettier, more realistic 3D—hope you like it!

Displacement Mapping

Among other features, the Parhelia introduces support for hardware displacement mapping. Is it cool? Absolutely. Will it be implemented in a shipping A-title anytime soon? Oh, no—not by a long shot. But the technology does suggest a bold new future for 3D modeling, so let's dig in.

A displacement map stores the actual shape of whatever is being rendered in a texture instead of a complicated 3D mesh. Displacement mapping is similar to bump mapping, except that bump maps don't actually change the shape of an object; they just create the *illusion* of change. Displacement maps, however, change a model's actual vertex arrangement.

Let's suppose you want to model a landscape covered with mountains and valleys. Traditionally, you'd create the terrain in a 3D modeling program like *3ds max,* then save the mesh as a complex 3D model laden with thousands of vertices. But in the new scheme of things, you'd first create a low-detail base mesh by hand, then superimpose a grayscale displacement map. All of the grayscale differences in the displacement map represent elevation changes—elevation changes that literally inform how extra vertices are created in the simple base model. When the displacement map is applied, the dark grays would create a valley of vertices, and the light grays would create a multitude of polygonal peaks. Interestingly enough, satellite photos of the earth could easily be converted into displacement maps, which could then be used to create 3D terrain for games. How's that for rocket science?

As you might have already guessed, displacement maps offer a very efficient way to store and move extremely complex meshes. For example, a large landscape can be stored as either a huge 3D model laden with 200,000 vertices, or as a four-vertex model and a 5KB bitmap (OK, that's an extreme example, but you get the point). The displacement map demands much less space in memory, and uses much less memory bandwidth. And keep in mind that a displacement map can describe just about anything, from terrain to character models.

Perhaps the best thing about displacement mapping is that it makes dynamic tessellation easy and doesn't require any extra creative work to do so. Tessellation is the process of drawing polygons, and *dynamic* tessellation is the process of adjusting a model's level-of-detail (LOD) on the fly: Objects in the distance are drawn with just a few polygons, while objects in the foreground are drawn in all their complexity. The technique saves your computer the trouble of drawing complex models that would be just a few pixels high, and frame rates increase as a result.

Current LOD schemes require the creation of several models of differing complexity. Each model is included in your game code, and as you get closer

Pixel shaders: Bringing You Cool-Looking Demos for 16 Months!

This fish has four different texture maps applied to it: a base texture, giving the fish its general coloring and stripes; a bump map, giving the skin its scales; a specular highlight texture that mimics real-world lighting; and a shader texture that imparts a shimmering light effect. Very cool stuff! But we have yet to see such detail in a shipping A-title. (Please note that this screen is not anti-aliased.)

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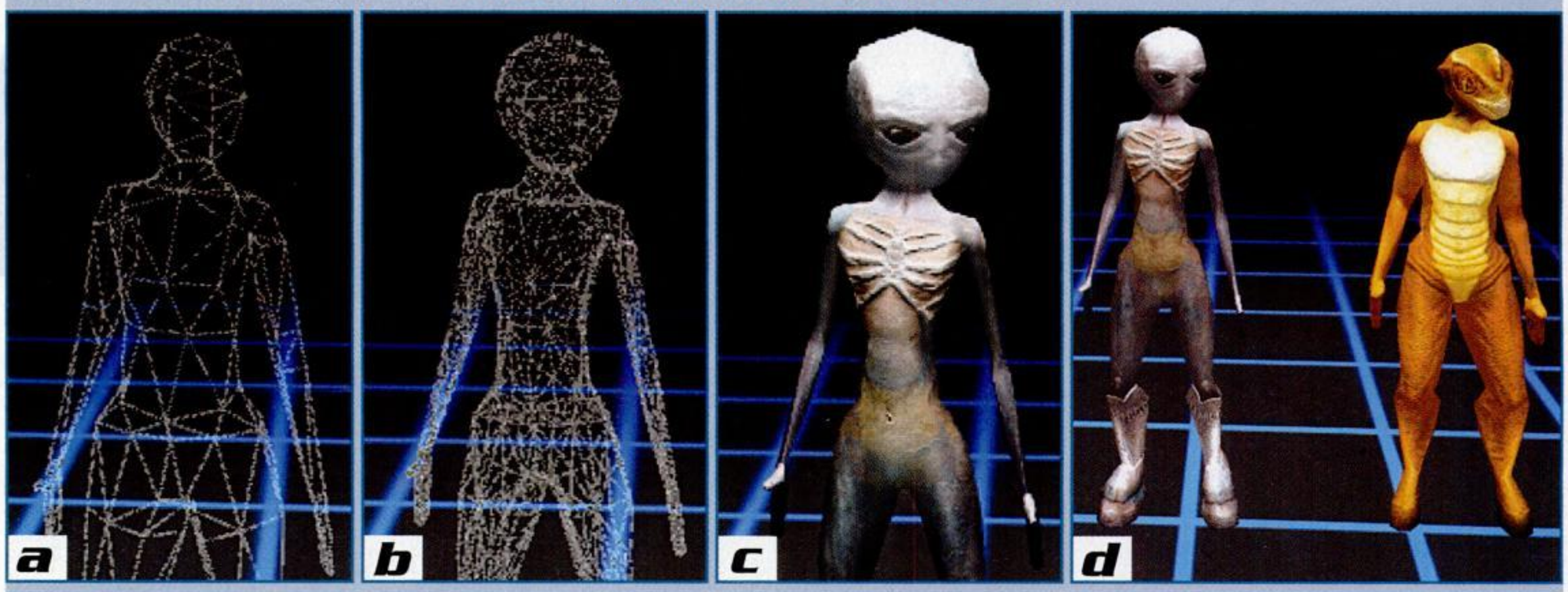
Displacement mapping: *Extra Polygons for Practically Free*



Displacement maps can help game developers quickly construct extremely complex models. First a low-poly base mesh is created **(a)**. Then the displacement map is applied, and the simple model is tessellated into a more detailed model **(b)**. Finally, a skin is applied to the new model **(c)**. Two different models can be derived from the same base mesh—just use a different displacement map and skin **(d)**.

to the object in question, the game switches to increasingly complex versions of the object. Sounds nice enough, but the technique can cause a jarring popping effect when the models transition from low-detail to high-detail. Displacement mapping avoids the popping problem by gracefully adjusting the LOD of a *single* model on the fly. Quite literally, the displacement map "grows" extra vertices in the base mesh as the model approaches. The trick improves visual quality and saves processing power.

Displacement mapping's biggest problem will be developer support. If you were a game developer, would you feel comfortable coding your game with new 3D features that can't be rendered by a majority of the world's videocards? Matrox says it has lined up support from a few developers—most notably Westwood Studios—but we question whether programmers will use what could end up as a Matrox-specific feature. To put this in context, consider that in the time since Matrox introduced Environment-Mapped Bump Mapping in 1999, a mere 40 titles have shipped with support for it.

2D: For Discerning Eyes Only

Once again, Matrox is claiming to provide the absolute best 2D visual quality available. This is great news if you've always been able to discern 2D visual quality differences from card to card, but a lot of us just can't see a difference when comparing Matrox, nVidia, and ATI 2D. That said, it's patently clear that Matrox is *trying* to draw a line in the 2D sand, and we appreciate the effort. The new 2D initiative includes 30-bit color depths, a revision of Matrox's venerable multi-monitor technology, and a continuing commitment to use only the highest quality parts in board designs.

Let's tackle color depth first. Current graphics boards are able to display around 16.8 million distinct colors. That works out to 8-bits of data for each of the three base color channels—24-bit color. But what if you open a high-detail *Photoshop* file that exceeds 16.8 million distinct colors? What if your 35MB TIFF file contains a billion colors? Well, with a traditional videocard you couldn't possibly see all of the image's lush potential. But because the Parhelia can resolve 10-bit color for each red, green, and blue channel, your eyes have a fighting chance to see the image in full detail. Bottom line: The Parhelia could well become the defacto board for image and video editing professionals. To this end, Matrox will develop a special 10-bit-per-channel image-viewing plug-in for *Photoshop*. We haven't yet tested 10-bit 2D in person, and we're skeptical if the human eye can really resolve a difference. But we'll follow this story and report back soon.

We should also mention that 10-bit color might tangibly improve color quality in 3D games. Most of today's games use 8-bit color for each of the three color components in a texture, as well as 8-bit data to describe the alpha, or transparency, of that texture. Now consider that very few games paint just one texture on a surface—most apply two, three, four, or even more textures to produce fog, specular highlights, reflections, and other special effects. As the textures are blended, information can be lost when values are rounded off. This causes unsightly banding, similar to the banding that was predominant in old 16-bit games. The use of 10-bit color, however, can preclude all that nasty banding. The result could be superlative visual quality.

On the multi-monitor tip, the Parhelia can drive two DVI displays or three analog displays, all from a single card. For this you can thank the card's three separate RAMDACs—two running at 400MHz, one running at 230MHz. Matrox says the two robust RAMDACs will be able to run two simultaneous displays at 2048x1536x32, while the third baby RAMDAC tops out at 1600x1200. And, of course, if you choose the right resolution, you'll be able to span a single Windows desktop across three separate monitors.

Finally, Matrox says its Parhelia boards will be built of the finest components available, leading to primo signal integrity and thus the best visual quality possible. As luck would have it, Matrox specs out and builds its own boards, so it doesn't have to worry about some far-eastern hack throwing the Parhelia GPU on a sloppy PCB.

The pre-production board we played with looked terrific, but we haven't yet seen a shipping board. So check back next month for our final verdict on visual quality, frame rate performance, and the whole damn shebang.

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One Parhelia + Three Monitors = All-Around Gaming Fun

Dual-monitor rigs: They're a godsend for regular 2D desktop work, but completely worthless for games. In most of the 3D games that will actually run across two screens, using a dual-monitor setup requires switching to a stretched mode, which treats both your monitors as one large, wide display instead of two independent displays with separate resolutions. In first-person shooters, the stretched mode places your crosshair squarely in the space between the two displays, making it impossible to track enemies. Even worse, most games won't even *run* across two monitors; they appear only on your primary display.

All of which brings us to the Parhelia's "Surround Gaming" feature. The card can run a number of today's best games across three monitors, and places your targeting reticule smack dab in the middle of the center monitor.

Although any 3D game can be programmed to directly support Surround Gaming, most of the early support for the feature will be in games that allow you to manually adjust resolution and "field of vision" settings. Most *Quake III* engine games, *Unreal* engine games, and some flight simulators have provisions for setting custom resolutions and FOV (though the controls must be exposed by the individual developer).

Tweaking resolution and FOV sounds like a hooptie approach to enabling three monitors, but it actually impressed the hell out of us during testing. We ran *Jedi Outcast* at the highest triple-monitor resolution the Parhelia supports—3840x1280—and expanded the FOV setting from the default 50 degrees to a more appropriate 150 degrees. There was a small amount of distortion at the far edges of the two outside screens, but during testing, we didn't find the skewing effect objectionable. We configured the monitors so that the three displays encompassed our heads, which put the distorted areas deep in our peripheral vision.

The result was an enveloping, truly immersive gaming experience. By increasing your field of vision, you also get much more content onscreen, which allows you to see bad guys creeping up on you much earlier. This begs the obvious question: Will gamers use Surround Gaming for a competitive edge during multiplayer? Perhaps so, but only if the Parhelia can muster competitive frame rates when running three displays.

With any luck, we'll also see games that use multiple cameras, instead of the increased FOV setting, to enable Surround Gaming. This requires developers to write triple camera support directly into their games, but also alleviates edge distortion and paves the way for some neat tricks. For example, we expect to see flight sims that let you configure each screen for a different view, or spread the interior of a virtual cockpit across all three screens. And the possibilities for first-person shooters are endless. Take a game like *Counter-Strike*—one camera displays your front view, one shows all the action behind you, and one displays a buddy's viewpoint. *Insane.*

Connecting the three monitors was a breeze. The board we played with had dual DVI-D connectors on its backplane. A simple DVI-to-DB15 adapter plugged into one DVI-D, and a DVI-to-dual DB15 adapter plugged into the other DVI-D. In triple-monitor mode, all three displays have to run at the same resolution and refresh rate, and they all have to use an analog DB-15 connector. So triple DVI is out; this is a limitation of the technology. The board includes two independent Papa-Bear RAMDACs, and one tertiary Baby-Bear RAMDAC. The big ones run at 400MHz, while the small one runs at 230MHz

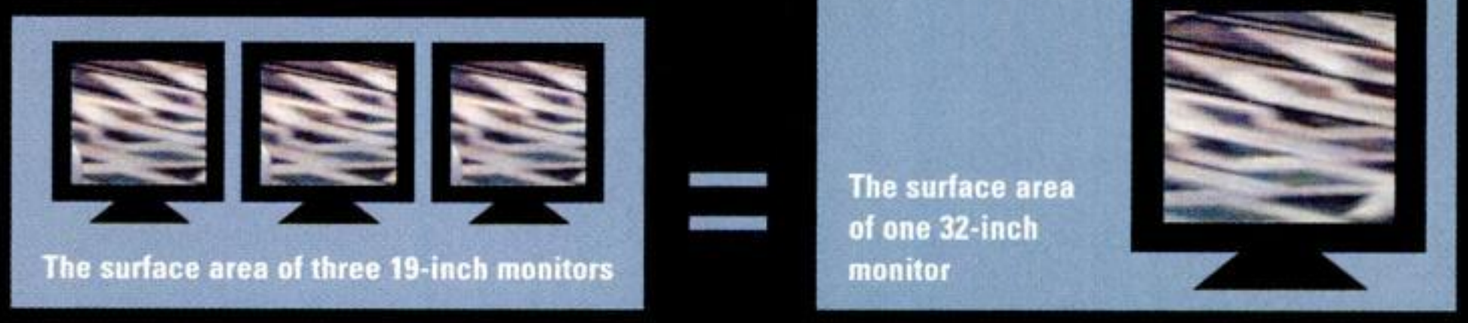
Running games at 3840x1280 isn't easy and consumes a helluva lot of resources. We don't expect that you'll be able to run three monitors with anti-aliasing and anisotropic enabled, but we could be wrong. All that said, playing games with three displays is a truly illuminating experience. No longer do you have to quickly turn left and right every time you enter a new room. Instead, you can just take a quick peek out of the corner of your eye. There's absolutely nothing more satisfying than pirouetting around and blasting someone who *thought* he was sneaking up on your blind spot. Indeed, after playing with the tri-display for an hour or two, the boys from Matrox had to pry their demo machine from our clutches.

We're not yet ready to pass final judgement on Surround Gaming, because our experience with the Parhelia was limited to beta-beta silicon. But if the technology is exploited properly, triple-monitor gaming could quite possibly become our favorite use of the modern 3D accelerator's copious surplus power.

What You See is What You Get

When you jump from one screen to three screens, your field of view jumps from 50 degrees to 150 degrees, and resolution goes from 1280x1024 to 3840x1024.

Real Estate Dividends



Three 19-inch monitors offer 483 square inches of screen real estate. This is roughly equivalent to the real estate offered by mongo-spectacular 32-inch displays.

GAMES WITH TRIPLE MONITOR SUPPORT

SHIPPING NOW

- Quake III
- Return to Castle Wolfenstein
- Jedi Knight II: Jedi Outcast
- Flight Sim 2K2
- Global Ops
- Vendetta
- X-Plane
- Trainz (with upcoming patch)
- Serious Sam: Second Encounter (with upcoming patch)

SHIPPING LATER

- Unreal Tournament 2003
- F1 2002
- Star Wars Galaxies
- Mobile Forces
- Realm Wars
- Combat Flight Sim 3
- Gore

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Beta Benchmarks, Beta Analysis

One afternoon in early May, a Matrox engineer dropped by with a pair of early Parhelia engineering samples, which we proceeded to benchmark mercilessly.

Convincing Matrox to let us benchmark such unrefined beta hardware was difficult, so we agreed to submit a list of intended tests for Matrox's approval. In the end, the only benchmarks we *weren't* allowed to run were our new *Jedi Outcast* timedemo (because we couldn't give the Matrox engineers enough time to test the benchmark for themselves) and our *Quake III* benchmark with anti-aliasing enabled (because AA wasn't working in *Quake III* with the beta drivers as of press time). Matrox also hadn't fully implemented its fallback super-sampling AA setting, so we were unable to test its performance.

Do not be alarmed, gentle reader! It's entirely reasonable for a videocard manufacturer to levy preconditions for beta hardware benchmarking. And considering that we played with the board so early in its QA cycle, we're not surprised that AA wouldn't work with *Quake III*. Obviously, when we do benchmark and review final hardware (hopefully next month), we'll run any benchmarks we fancy.

All benchmarks were run on our 2GHz P4 test bed with 512MB of RAM. All tests were run at 1280x1024 in 32-bit color, except for the default *3DMark2001 SE* tests, which were run at the default 1024x768. Matrox wouldn't reveal the core and memory clocks for the board we tested, except to say that they are slower than the anticipated final clocks. And now, on with the benchmarks!

	Quake III MPC Demo	3DMark 2001: SE Game 2, High Detail	3DMark2001: SE Game 4	3DMark 2001 SE default settings
No AA, no anisotropic filtering	72.1fps	56.3fps	21.1fps	7698
16x AA, no anisotropic filtering	Would not run	47.7fps	15.0fps	6089
No AA, anisotropic filtering on	56.6fps	45.5fps	10.8fps	6526
16x AA, anisotropic filtering on	Would not run	40.1fps	8.9fps	5241

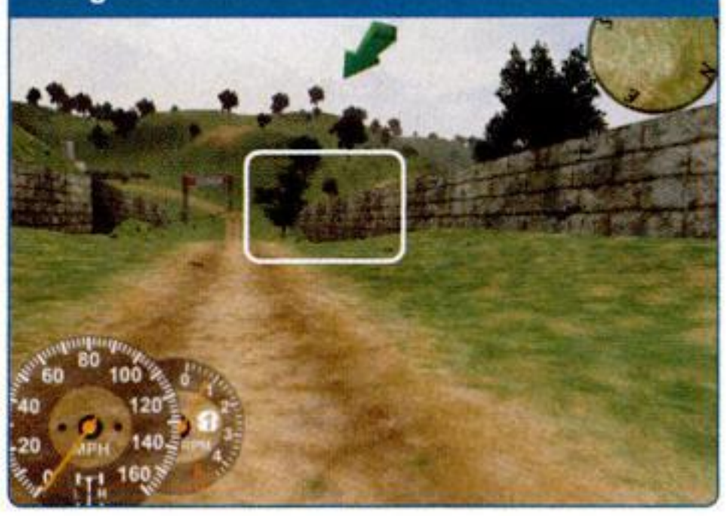
Because the Parhelia hardware and drivers were so beta, it would be unfair to compare our benchmark results to the scores of a competing part. So let's focus on what you might gain—or sacrifice—when you enable certain Parhelia features.

For example, turning on Matrox's special 16x fragment AA resulted in a modest 15 percent hit in *3DMark2001* Game 2, but cost about 25 percent in the more intensive Game 4. For this, we credit the Parhelia's immense memory bandwidth. Game 2 doesn't require much memory bandwidth, so the benchmark is able to weather memory-intensive features (such as AA) without suffering a brutal frame rate plummet. Game 4 requires more memory bandwidth, so the frame rate hit is worse with 16x AA enabled. This hypothesis will probably be verified during final benchmark runs with other tests.

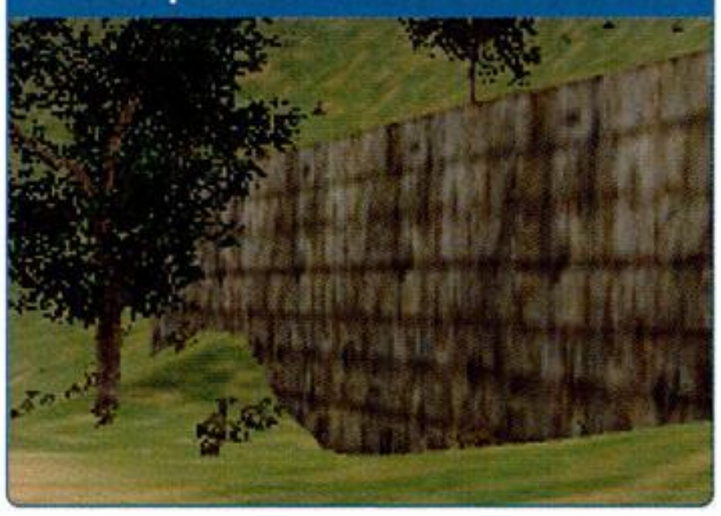
Enabling anisotropic filtering yielded similar performance differences. When we enabled anisotropic filtering in *Quake III* and Game 2, we saw about a 20 percent performance hit. However, in Game 4, we saw a whopping 50 percent slowdown when anisotropic filtering was enabled. This indicates that games that demand only two texturing pipelines (such as *Quake III)* can use the Parhelia's quad-texture pipeline to pull off anisotropic filtering without a brutal performance hit.

But all of the above is just food for thought. The board and drivers we benched were as immature as a 16-year-old in his first Subaru WRX. For the final verdict, check back next month.

Magnified area



Anisotropic off



Anisotropic on

These three screenshots show what anisotropic filtering can do for visual quality. We'll be looking at the right wall in this screenshot from *4x4Evo 2*. We've blown up the area in question so you can see the details.

This section of the wall is about 150 yards from the camera's position. Textures that are close to a game's camera are sharp and in focus. However, textures like this, which are further away from the camera, become progressively fuzzier.

Add anisotropic filtering, and you've got crisp, clear textures across the whole wall. The texture is every bit as clear 150 yards from the camera as it is two feet from the camera.

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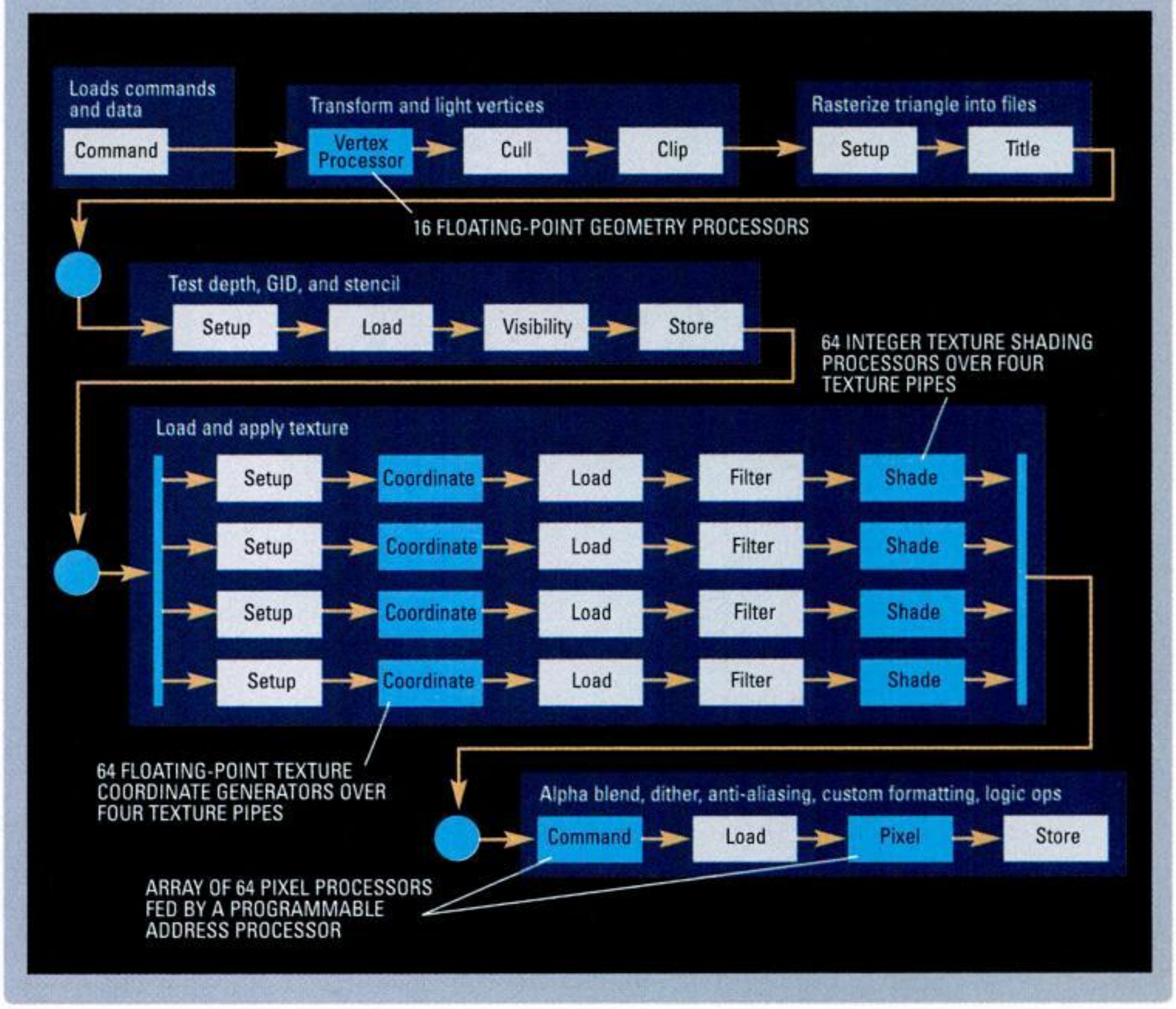
Creative Labs, nVidia, and ATI Prepare for Battle Stations

Four 3D companies duking it out? It's like 1997 all over again!

Matrox might be first out the gate with a zany new take on consumer 3D, but ATI, nVidia, and 3Dlabs (by way of Creative Labs) are all preparing competing GPUs to show just who's boss. ATI didn't want to talk about its next chip, the R300, until the technology nears its release date, which we assume will be sometime next winter. But we were able to get some circumlocutory dirt from nVidia, as well as some hardcore specifics from 3Dlabs.

A Close-up Look at the P10's Programmable Pipeline

Holy crap! It would take a rocket scientist to understand this stuff!



nVidia

David Kirk, chief scientist for nVidia, wouldn't talk specifics about his company's next-gen part, most likely code-named NV30. But he would comment on 3D generalities. Read between the lines, and connect the dots: nVidia will be focusing on pixel shaders in the never-ending quest for *Toy Story*–level graphics. The future is written—but will game developers be reading from the same script?

MPC: What features would you like to see in a DX 9 part?

KIRK: The first thing is that in the past few years, we've seen not only the integration of hardware transform-and-lighting into the 3D pipeline, but the evolution from there into the programmable pipeline. However, the power of the vertex engine shows that the pixel engines have a long way to go. Right now, we're doing enhanced texture-mapping, and although it's programmable, we're doing a small number of ops on a large number of pixels. In DX 9, we'll be able to pursue cinematic-level pixel shading.

MPC: What will DX 9 let you do that DX 8 doesn't?

KIRK: The really exciting thing is flexibility and power in the pixel pipeline. There are hundreds of calculations being done per pixel in movies. On the PC side, fill-rate has been growing, and we're at a pretty good place. Putting more floating-point math in the pipeline per pixel is our focus. Instead of rendering more and more pixels, we want to render better pixels. Instead of adding more layers, we want to do more calculations on fewer layers.

MPC: Why do you think people should pass over Parhelia in favor of the next nVidia part?

KIRK: I don't see any real compelling new features that would be experienced by a consumer. The real exciting developments are in advanced pixel shading. More computation and more precision. I don't think we've seen the product that offers that yet.

3Dlabs

We were floored when we learned Creative Labs was acquiring 3Dlabs specifically to reenter the 3D market. Creative stopped hawking videocards in the U.S. around the time of the GeForce3 launch, and we figured it would never return to the 3D meat market. But then came along 3Dlabs's new P10, a 3D accelerator that takes shader technology and memory management to a higher level. 3Dlabs will sell the P10 in workstation trim, while Creative Labs will market the GPU in a new line of boards intended for hardcore gamers.

Like the Matrox card, the P10 will include DirectX 9 vertex shaders, but only partially compliant pixel shaders. However, unlike the rest of the "programmable" 3D accelerators that are available today, the P10 is fully programmable.

In current architectures like the GeForce4, small shader programs can be used to manipulate pixel and vertex data. The simple programs are restricted to just a few instructions, and are limited in overall functionality (though they still offer way more flexibility than what was available in old-school 3D accelerators). 3Dlabs's P10, however, will allow game developers to write much more complex programs without limitations on the number of instructions. In fact, the P10 will function much more like a CPU than a graphics chip and will feature SIMD technology and flow-control ops to enable truly programmable 3D acceleration.

The P10 will also include a virtual memory model, which, in the short run, could provide more tangible benefits than the ultra-flexible programming engine. Instead of treating onboard memory as a simple frame buffer (which is what all current 3D accelerators do), the P10 uses the onboard RAM as an L2 cache for main system memory. Caching schemes intelligently shuttle data between main system memory and the onboard cache, enabling an addressable memory size of a whopping 16GB! Your current videocard probably has an addressable memory of 64MB or 128MB—so you do the math. The upshot is that developers who code for the P10 will be able to implement larger textures and increased complexity in 3D scenes, assuming the scheme works as advertised. ■

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Illustration by: MARK HARRIS

THE PARANOIAC'S GUIDE TO PC PRIVACY

Virus protection? Check. Firewall? Check. Security updates? Check. Guess what: They can still hear you, they can still see you, and they're still lurking around in your PC. Put down the weapon—sir—and follow these 10 simple steps for total PC privacy.

BY JASON COMPTON

You probably already know the three golden rules of PC security: Install a virus scanner, and update its signatures obsessively. Install a firewall, and configure it properly. And, finally, visit www.windowsupdate.com, and download the latest security patches for your OS. If you haven't done any or all of these things, do them first. Do them now.

But even if you have covered these basics, it's doubtful your PC is a hermetically-sealed lock box. For example, even your vaunted firewall might not be able to prevent anyone with a laptop from parking in your driveway and tapping into your wireless network. And even if you've dug a 50-foot moat around your PC, those MP3 file-sharing programs that you let through your drawbridge are likely carrying secret pop-up ad payloads. And spam continues to make your in-box look like a Hormel shareholders meeting. And all it takes is one configuration misstep to share the entire contents of your hard drive with online weasels looking for kicks.

Yes, the world of computing is fraught with trespassers who want to either flood your PC with crap or extract its precious contents. But, luckily, there's an easier way of protecting your points of entry than sitting on your keyboard with a shotgun, warning interlopers to git off yer prop'ty. We give you 10 steps for rooting out and plugging up your most overlooked security breaches.

It's your PC—so if you don't protect it, who will?

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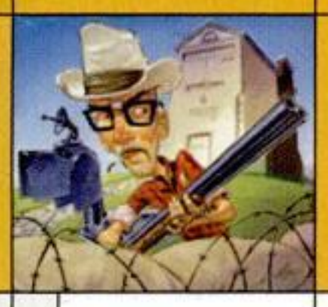


Secure Your Wireless Network

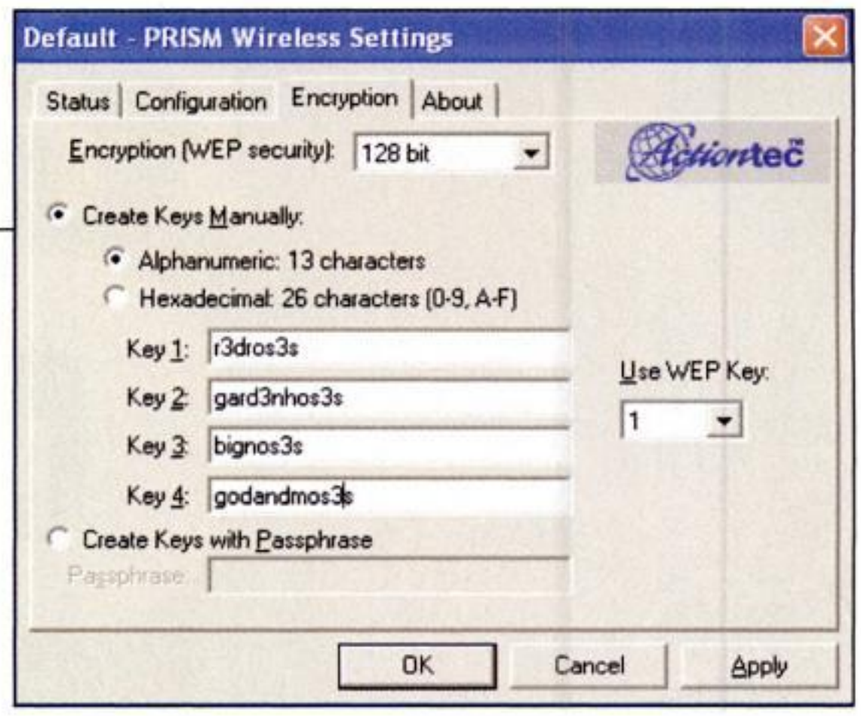
Step 1: Shut off your wireless access point. Step 2: Go to Home Depot, buy a 1000-foot spool of Cat-5 cabling, and...

No? OK, then a wireless network it is. But if you put your network on the air, you're taking chances—unless you play it smart. If you don't implement the right precautions, it's child's play for the shut-in who lives downstairs to hop on your network, hog your downstream bandwidth, and poke around your PC. That's because WLAN hubs, unless instructed otherwise, will try to make as many connections with WLAN network interface cards as possible. Don't believe us? Fine. Just be aware that reporters and joyriders from San Francisco to London have cruised city streets and managed to jump on the WLANs of private homes, banks, and even enormous corporations like Sun Microsystems!

First things first: You should password-protect any and all shared resources on your networked PCs. You should have done this the day before your friendly broadband installer came by, but it's never too late to start. So go to the Network control panel, click File and Print Sharing, and shut off any and all sharing that you don't actually need. This entails a quick audit of shared drives, printers, and folders, or just the flat-out removal of the Microsoft Networking component in the Networks control panel in the event you don't need to share files at all. Don't share your c: drive "just in case," and don't leave that FTP server running for fun.

If you don't implement the right precautions, it's child's play for the shut-in who lives downstairs to hop on your network.

Now the serious stuff. Chances are that your 802.11b access point has plenty of security features that you aren't using. Yes, WEP (Wired Equivalent Privacy) encryption can be broken, but it takes a while (about 15 minutes and 500,000 packets). Turn it on at the access point. Enable it on your wireless machines. And consult your documentation to find out how to change the WEP key every so often, preferably to something more cryptic than your pet's name.



By entering four different WEP keys, you can rotate them as often as you like. The Trekkie term for this is "modulating your shields."

Check your access point configuration for an option that prohibits wireless clients from using "ANY" as their SSID, and go one step further by restricting access to only known MAC hardware addresses. Yes, this means an extra 45 seconds of setup time when your buds come over for a WLAN party. Tough.

You should also ensure that your access point's configuration software is protected by a password that, like your WEP key, isn't easy to guess. If you can, go one step further and allow only local (wired) management—no point throwing up these barriers if someone can just link directly to the access point and knock down the walls.

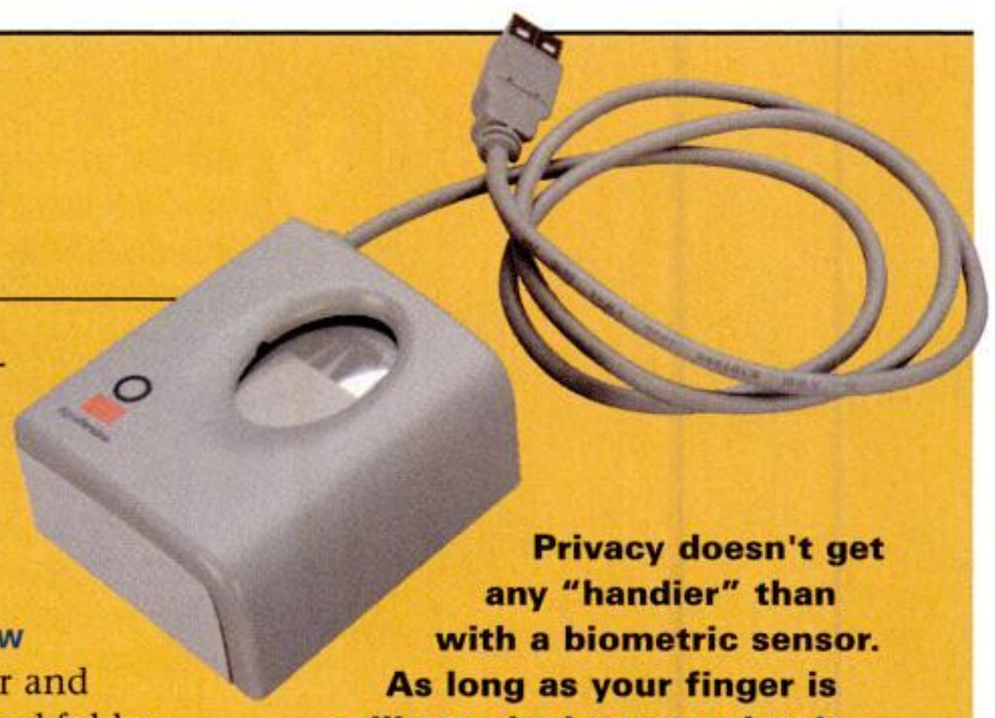
Contact your Wi-Fi hardware vendor to see if it has an update that closes the WEP holes; for example, ORiNOCO's proprietary WEP-Plus upgrade. Because broken WEP security has sent the standards bodies and vendors scrambling for both short and long-term fixes, you probably won't be able to use one of these new proprietary solutions if your access point and wireless NICs are from different vendors. Nor will you want to do so once better standards like 802.1x get hammered out. The truly paranoid should take any port in a storm.

Oh, and take down that freaking wireless cam you've got aimed at the beer fridge. It's probably broadcasting in open analog, so anyone with equipment capable of receiving wireless signals can pick up images of you scratching your ass.

Preventing Brazen Theft

If you're afraid your PC will be used by UPSRs (unauthorized porn-seeking roommates), and you're not satisfied with password controls, then you're going to need a more physical approach. Griffin's SecuriKey (**www.griftech.com**) is a simple USB token that can lock down your PC when removed. No key, no c:\.

If you're prone to losing passwords or leaving USB keys in the laundry, then go totally James Bond and pick up a biometric sensor. The Targus DEFCON Authenticator (**www.targus.com**) and DigitalPersona U.are.U (**www.digitalpersona.com**) both put a fingerprint sensor between a would-be gaffler and the promised land. Both come with multiple-user support and built-in file and folder encryption. U.are.U costs far less than $100, so biometrics won't break you. Oh, and for bonus points, use a toe instead of a finger for your security print. Sure, you'll look funny when you're unlocking your system, but imagine the look on the hoodlums' faces when they discover that your severed hand won't grant them access to your box!



Privacy doesn't get any "handier" than with a biometric sensor. As long as your finger is still attached to you, that is.

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Ditching Spyware

Few Internet Age scams are as galling as spyware. Here's the premise: You download my program (usually free of charge), install it, then futz around in blissful ignorance. But along with the legitimately useful code I've given you, I've also folded in a module or six that sit in the background, monitoring your usage patterns, search terms, and web clicks, and reporting back to home base every so often. Maybe my spyware will just suck up your CPU cycles. Or maybe I'll surreptitiously feed your personal habits into Big Brother's database. Hey, I mentioned this arrangement in the fine print before you installed my app. Weren't you paying attention?

Spyware is anathema to the basic tenets of privacy. So combat it with *Ad-Aware*, which seeks out and destroys spyware components, and gives you back privacy and peace of mind. Simply grab the latest version from **www.lavasoft.nu**, and order a deep scan and full check on all drives. *Ad-Aware* will return a task list complete with highlighted adware modules, plus a table of applications, data files, cookies, and Registry entries devoted to monitoring your electronic existence.

Ad-Aware seeks out and destroys spyware components, and gives you back privacy and peace of mind.

Programs you never heard of, from people up to no good. Snuff them out with *Ad-Aware*.

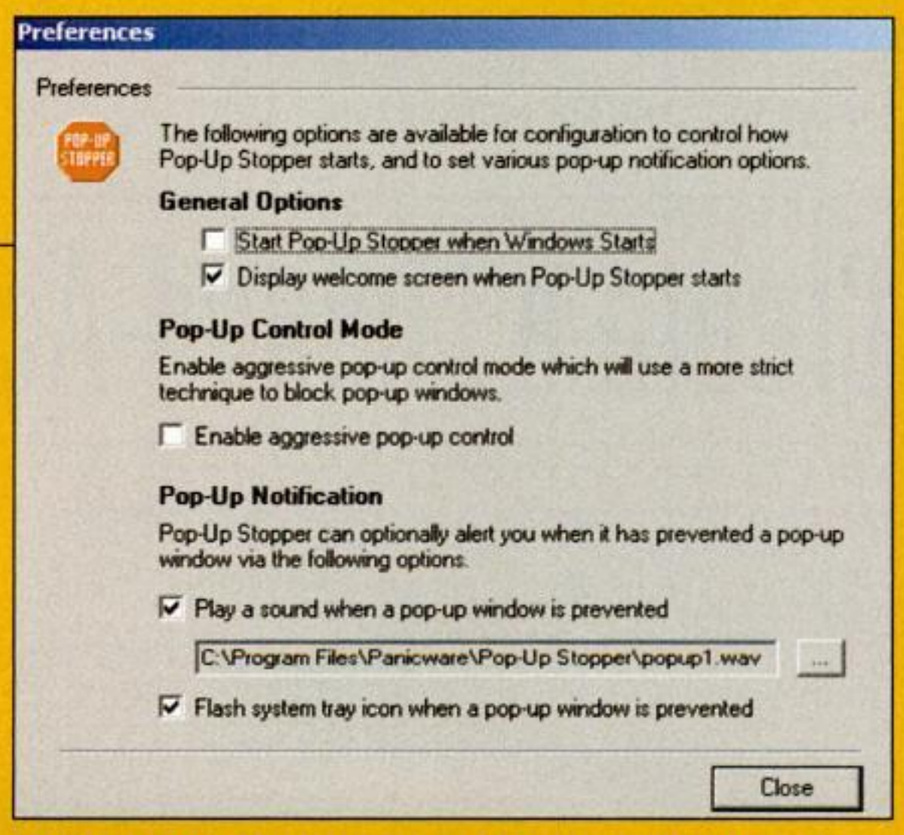
Once the *Ad-Aware* scan finishes, hit the checklist of components and files you want to ditch, and let the software do its thing. Occasionally you may need a reboot, and anything particularly pesky may require a quick trip to the Lavasoft forums for a solution, or simply an update of *Ad-Aware* through a spyware reference file. Remember that some "mothership programs" know when their spyware agents have been deep sixed, so don't be terribly surprised if the host app that actually provides a useful service refuses to run in the future. Them's the breaks (though you can tell *Ad-Aware* to ignore components you know you'll need to keep).

Although *Ad-Aware* offers a free version, the realtime *Ad-Watch* protection module is $15 for a lifetime membership, and purchasing it is a nice way to show a little appreciation. And since the best way to block a punch is to "no be there," as Mr. Miyagi says, check the list of spyware-free alternative software choices at **www.lsfileserv.com/more.html**. Chances are you'll find a "clean" app that can do everything your nasty spyware-laden heap could do.

Stop Popups

Yep, the banner ad just wasn't getting the job done, so the Silicon Valley ad wizards invented the popup. Well, screw them—paying their bills is their problem, not yours. Shut off the popups, and gloat about it.

The old-school method would be to simply disable JavaScript, but this approach tends to screw up friendly script-heavy web sites. Fortunately, there are plenty of tools to pick up the slack. For a free utility that does the job, check out *Pop-Up Stopper* (**www.panicware.com**). Just make sure you at least leave the "tray flash" option enabled so you know what's being blocked, on the off chance you're missing something important. And disable sounds unless you love hearing "boing, boing, boing" every time you visit a corporate web site. Most blockers, including *Pop-Up Stopper* and another free alternative, *Stop-the-Pop* (**www.bysoft.se/sureshot/stopthepop**), let you hold down Shift or Control to temporarily allow a popup.



Those half-dozen unwanted browser windows are a thing of the past.

The free blockers tend to be all-or-nothing affairs—if they're on, they block. But for $20, you can upgrade to *Pop-Up Stopper Pro*, or get *PopNot 2.0* (**www.hdsoft.com**). These programs offer much more refined user control, including site-by-site rules for popups and greater sensitivity in delineating "good" and "bad" pops.

The alternative is to unattach yourself from Microsoft's web browser teat and switch to Mozilla (**www.mozilla.org**), which has a very nice option to stop "unrequested windows." Uncheck this option, and boom, no more pops—no third-party software required. If you want to nix scripting altogether (which isn't recommended for most sites), you can shut it all down from here. The equivalent menu in *Internet Explorer* can be found at Options/Security/Internet Zone/Active Scripting/Disable.

Finally, don't forget to vote with your feet. If a site assails you with popups and you don't like it, take your eyes elsewhere.

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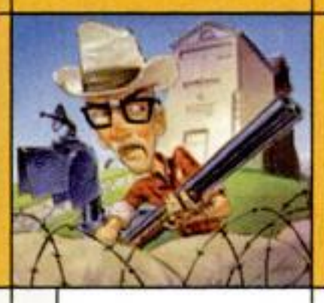


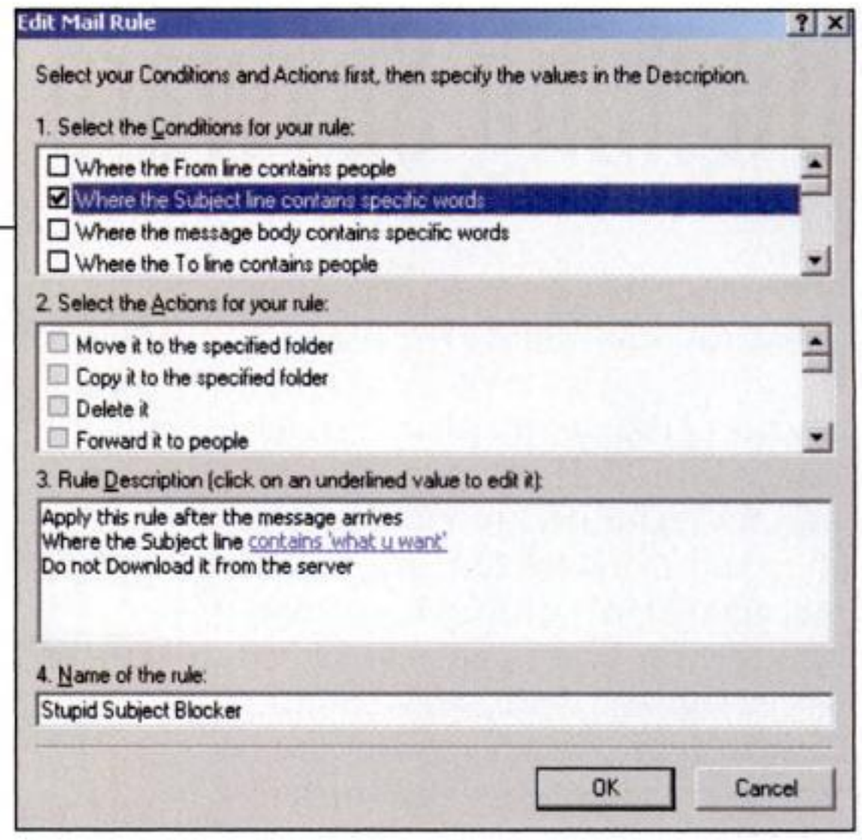
Slam That Spam

Spam is really a network and server problem—you're just the poor sucker at the end of the line. Frankly, most major sysadmins hate spam more than you do, because relaying and delivering e-mail nobody wants to read is a big pain in the arse. So your first move should be to encourage your ISP's technical folks to do something about the problem at their end. If they ignore you, ditch 'em for someone who cares.

The remainder of your anti-spam crusade comes down to common sense. For example, whenever possible use a secondary e-mail account when you sign up for any mailing list or web membership. (Your ISP should give you enough extra mail boxes to choke a rattlesnake, and if not, tell them to start doing so, especially if you're on broadband and feeding them $600 per annum.) Also, when a person or web site of dubious moral fiber asks for your e-mail address, lie whenever possible—and try not to post your primary address in plain text *anywhere*.

When a person or web site of dubious moral fiber asks for your e-mail address, lie whenever possible...

The filtering capability of any good, free e-mailer will do the rest. In *Outlook Express*, configure Tools/Message Rules to sort out the chaff. The program can even order your mail server to auto-delete any messages containing the phrase "Unique Nigerian Investment Opportunity." Go to Tools>Message Rules>Mail>New to create a new rule, which requires selecting a condition (that is, a specific word in the subject, origin, destination, or body text), and an action (for example, delete immediately, sort into a separate folder, or forward to a different e-mail account.)



In *Outlook Express*, you're a few clicks away from shutting off mindless e-mails.

If you made it onto someone's daily newsletter mailing list by mistake, add the list's domain to *Outlook's* Blocked Senders list and be done with it. If you're looking for names to seed your Blocked Senders list with, go to **www.spamhaus.org/rokso/index.lasso** for a rogue's gallery of known spammers.

Don't go too crazy with the rules that auto-delete or ignore mail, because *Outlook Express* doesn't tell you when it's ignoring a message. When in doubt about a keyword or domain, use the Message Rules to redirect mail into a "Suspicious" folder that you check only while you're washing your whites.

And if you're mad as hell at a particular spammer, and want to make sure you complain to the right folks, check out the Spam Combat page (**combat.uxn.com**). It's a great front-end for tracking down spammers and their ISP co-conspirators where they live.

Finally, remember that e-mail can contain cookies too. So clear your cookies if a particularly insidious piece of spam does make it past your automated filters.

Create a Limited-Access Zone

Lock them out with user accounts.

If you're running Windows 98SE, there's not a whole heck of a lot you can do to prevent access to the OS, but Windows 2000 and XP users have more login-protection choices. The first priority should be to set a meaningful password for your Administrator account. This can be done by going to the Users and Passwords control panel in Win2000, or the User Accounts control panel in XP. From here, create a new user account for day-to-day use that is in the "Power Users" category. Use a second password, and consider pairing up the password with a biometric or hardware key.

Securing your system from others is much easier to do if you have a strategy beforehand. It's very easy to shut off guest access to an entire drive, so wouldn't it be sensible if all of your sensitive files and applications resided on that drive? Once that's done, right-click the drive and use the Security tab to remove access for "Everyone," and re-add full control only for Administrators and your individual, everyday login. Explicitly set Guests to be denied full access.

Then, and only then, may you add access for another user or two. Win2000 and XP come with a disabled Guest account that will now be roped off from files and system settings. If your visitors need their own home directories, add more accounts. Just be very sure they stay in a user group that's shut off from your valuables. If you have to, uninstall everything but *Solitaire* from your c: drive.

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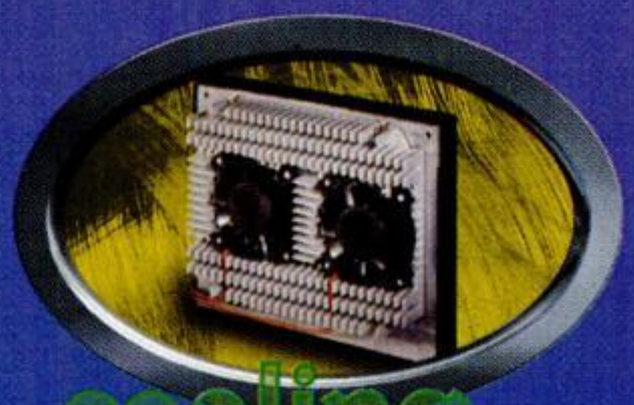

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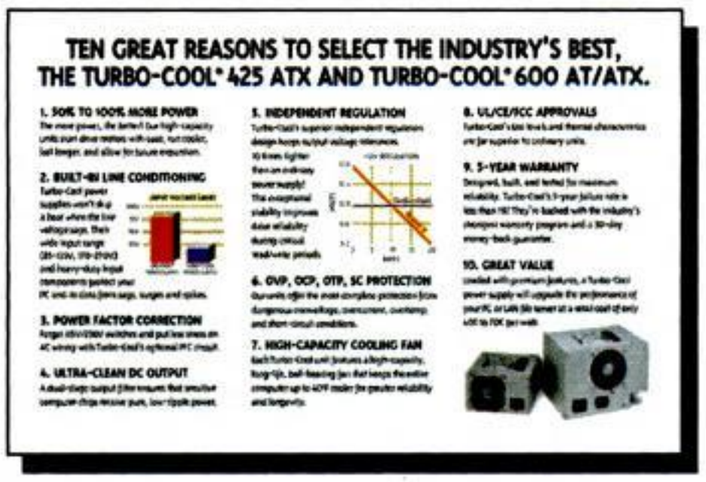

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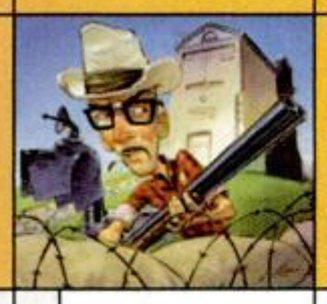


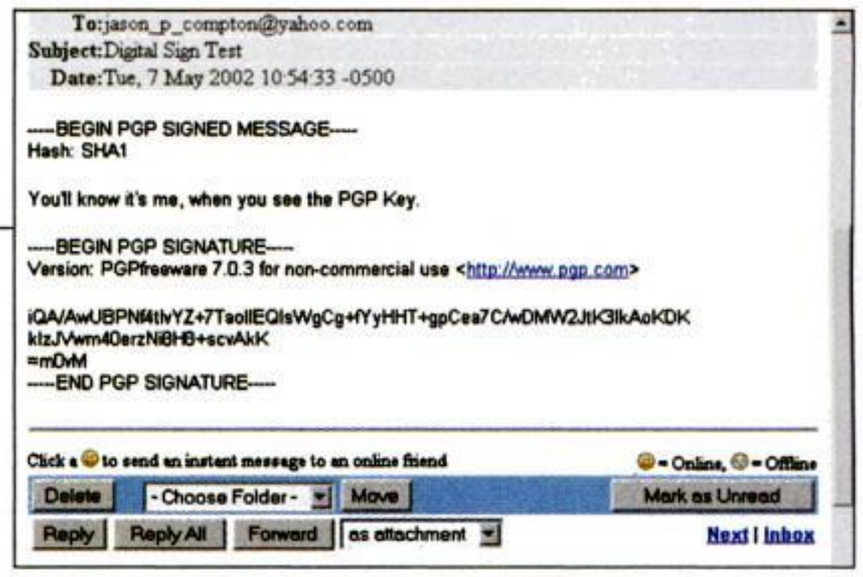
PGP = Secure 4 Me

About 3,200 alien computers see your e-mail before your pal in Akron gets it. Not good. Particularly if you're a paranoiac. So you might consider e-mail encryption, which presents a completely scrambled miasma of characters to anyone who tries to open your e-mail without the right decryption key.

The latest versions of *Outlook Express* (if not all mail programs) come with public key encryption and certificate protection. But don't screw around—go right to the good stuff. Get *PGP* (that's Pretty Good Privacy, if you don't speak geek). You can download the latest freeware version from **www.pgpi.org**; there's support for damn near any computer with a keyboard and a screen, so rest assured, your encrypted PGP messages can be opened even by your freak friend with the Atari ST.

You can install *PGP* to integrate with *Outlook*, *Outlook Express*, and *Eudora*. Volunteer that you're a new user, and the installer will walk you through the process of creating your public and private keys. Enter a passphrase, and *PGP* makes two keyfiles—one that you keep and never share, and one that will be published to a public keyserver so friends and associates can decode your messages. Once installation is complete, open the PGPKeys utility, right-click your e-mail profile, and ask to publish to at least one PGP key server.

If you want to make sure your [e-mail] readers know that you are who you say you are, use "Sign Message [PGP]."



But how do they know it's really from you? Because it's got your *PGP* signature, that's how.

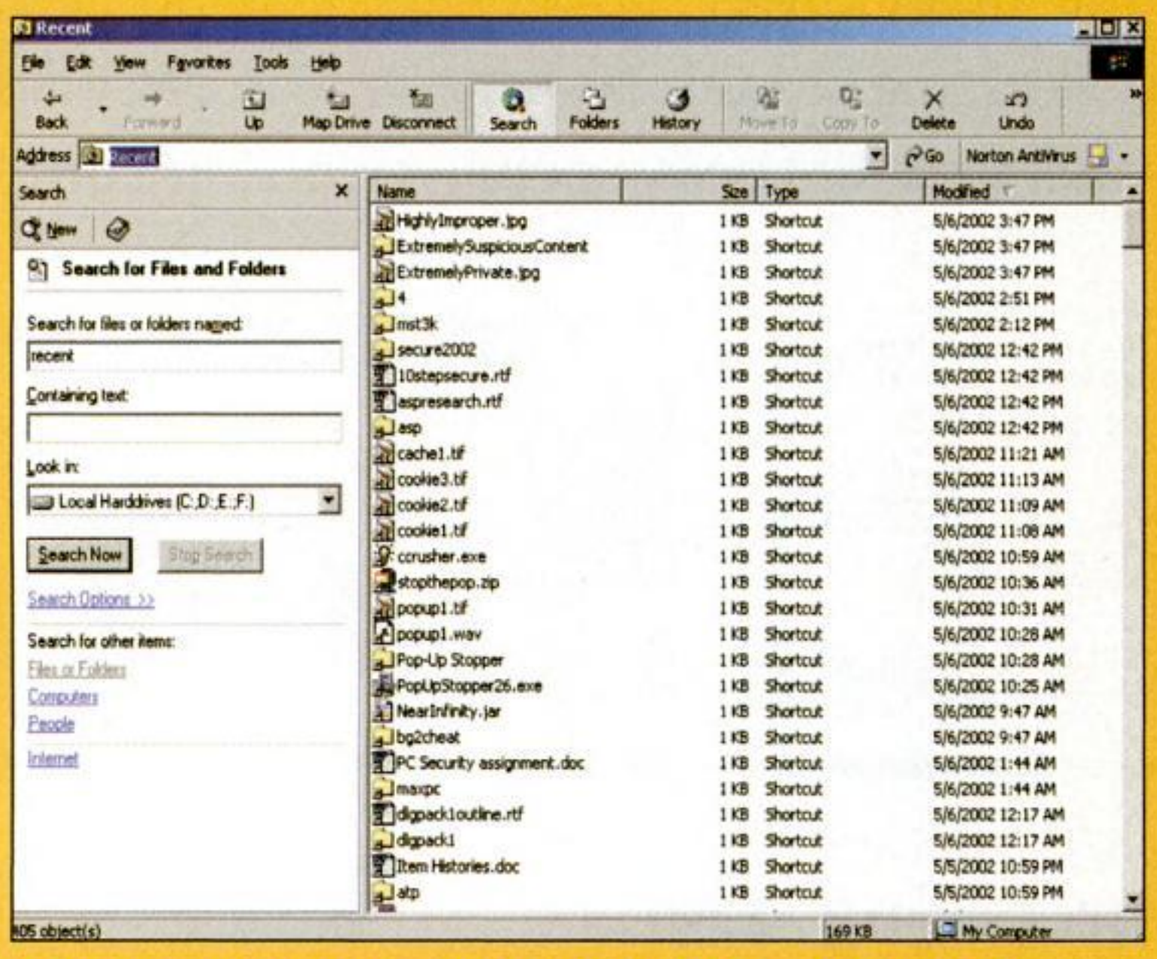
There are really two uses for *PGP*: to encrypt an e-mail or file so that only intended readers can see it, or to "sign" a plain-text message so that readers can verify that you truly wrote it.

To send a *PGP* e-mail in *Outlook Express*, make sure the "Encrypt Message (PGP)" button on the far right of the e-mail bar is depressed. Your recipient(s) also need to be *PGP* users, so *PGP* will look on your computer and on the public keyservers for their public keys, so that everyone gets a uniquely encrypted message. When they receive your encrypted message, their *PGP*-enabled mailreader will look up your public key and decode the text.

If you just want to make sure your readers know that you are who you say you are, use "Sign Message (PGP)." The text will be sent clear, but a *PGP* signature appears at the bottom that readers can look up against your public key to confirm that you had entered your private key passphrase when you wrote the message.

It sounds more complicated than it is. It's simple, it's secure, it rocks.

Make History History



Your computer never, ever forgets what you've loaded.

The Documents menu that branches off your Start button is a billboard that reveals your PC antics to anyone who cares to rattle your desktop. You can eighty-six a single entry in the Documents list by right-clicking to delete it, but Windows keeps a longer history than it displays by default, so another file will simply pop into view in the menu.

To go for the jugular, you'll want to clear out c:\Windows\Recent (in Win98) or c:\Documents and Settings\[username]\Recent (in Win2000 and WinXP). Be aware that 2000 and XP store a long history. You'll probably have forgotten about half the stuff that's in there, but we're sure you still don't want others to see it.

Your browser's location bar speaks volumes about what turns you on, so to speak. Use Internet Options/Clear History to dust *IE's* location bar. Of course killing your browser history effectively kills the auto-completion of typed URLs, but nobody said security was easy.

Finally, many applications also remember the last folder you opened a document from. So if you don't want people to know you were just listening to Glenn Miller, be sure you open a file in *Winamp* from a decidedly non-Glenn Miller-esque MP3 directory before you close the app.

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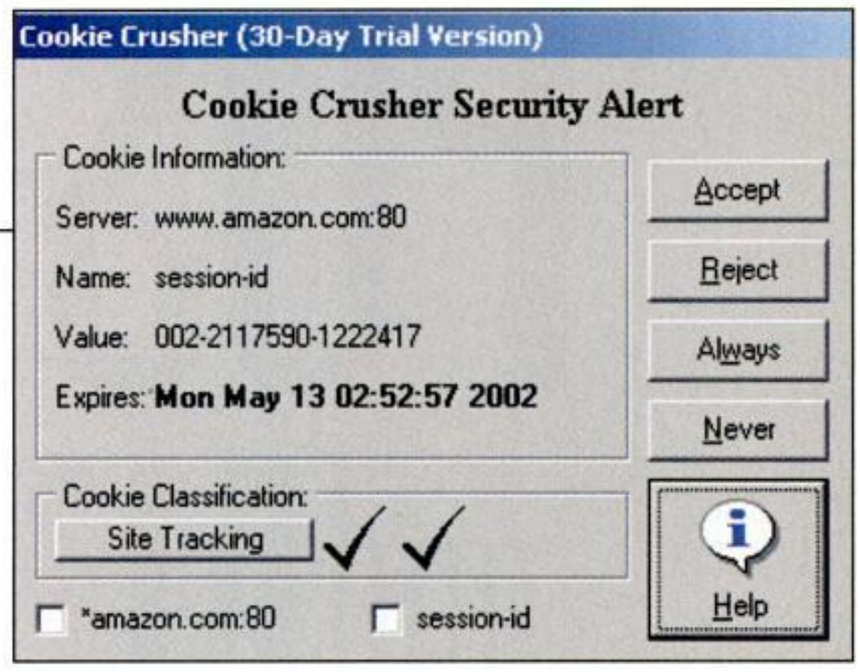
Kill Cookies and Cache

There's an unbelievable load of crap piling up on your c: drive—and most of it is web site content cached by your web browser. We're talking cookies, GIF files, and grainy JPEGs of Suzanne Somers that didn't impress you three months ago when you first browsed them, and still don't impress you now.

First things first: Limit the amount of cookies your computer accepts. There's just no reason to even think about accepting a third-party cookie, because by definition, it doesn't help you deal with whomever it is you're trying to do business with. In the latest version of *IE*, go to Internet Options/Privacy/Advanced, and set Third-Party Cookies to "reject." (Netscape and Mozilla browsers have similar options for cookie rejection, as well as options for all the other operations we're about to discuss.)

While you're in your Options menu, check out the truly outrageous amount of space that's allocated for cookie and page caching. Go to Tools>Internet Options>Temporary Internet Files, and click Settings to see how much cache space is set by default. Snoops can't find content that's never been cached, so reset your allotment to a much smaller capacity. You'll suffer a performance hit when revisiting many web sites, but what's a better use of your time: A few extra seconds spent downloading, or explaining to all your poker buddies why you have pics of Russian mail-order brides?

There's just no reason to even think about accepting a third-party cookie...



Web cookies: They bake 'em, you break 'em.

Remember that web browsers like to scatter their files around: *IE* drops content in both Downloaded Program Files and Temporary Internet Files (both typically found in your main Windows directory). The Downloaded Program Files folder should only include content you've gone out of your way to suck down and save, but give it a peek every so often, both visually and with *Ad-Aware*.

To actually nuke your junk, go back to your browser option menus and hit Delete Files (for the cache) and Delete Cookies. To stop a specific site from cookifying your PC, go to Internet Options/Privacy/Edit, and enter the domain names of the offenders. You can grab these names by simply browsing the contents of your cookie folder and plucking out suspicious names like DoubleClick.

Finally, if you're hardcore, check out *Cookie Crusher* at **www.thelimitsoft.com**. This utility lets you do detailed analysis and block detritus on a cookie-by-cookie basis.

Batten the Hatches! Encrypt the Files!

All this straining can add up to a whole lot of nothing if someone can just rip out your HD and do a bit of "data forensics" to get what they want. So start encrypting the stuff that really matters—all the data on your platters.

Win2000 and later OSes come with Encrypting File System, a feature built into NTFS partitions. It's better than nothing, and easy to set up. Right-click any disk, file, or folder, select Advanced, and enable "Encrypt contents to secure data." Done. Data is disguised from the snoops and haxors.

Note that the encryption of EFS is not based on a password or key system—if Windows authorizes a user to access the file, it will happily decrypt it for them. So be very careful that you use the Security tab to line up guest and other user privileges where they should be. If that's not enough for you, or if you're using 98SE or ME, a good biometric access package (see "Preventing Brazen Theft") should include file and folder-based encryption.

If even that's not enough, go hardcore and start applying deep *PGP* encryption to your disks as well as your communications. You can nab the freeware version of *PGPdisk* from **www.pgpi.org/products/pgpdisk** and use it much as you would for e-mail—to disguise files and folders with a key structure that can be kept private or shared just with trusted others. It's also more portable than EFS, since you can take *PGPdisk*-encrypted data anywhere and reinstall it without sacrificing security in the interim.

The freeware version of *PGPdisk* is inferior to regular *PGP*, so you may need to either use an older version of *PGP* for e-mail, or purchase the latest *PGPdisk* from Network Associates. ■

Use NTFS, get one-click encryption of files. Not bad.

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the POSITIVES and NEGATIVES of portable power

We give you Batteries, the unsung heroes of the real wireless revolution

By Logan Decker

The minute you fire up your MP3 player, tum on your PDA, or start snapping pics with your digital camera, you're initiating a furious chemical chain reaction. Soaked in a bath of sulfuric acid, a zinc strip begins to oxidize, flinging out positively charged ions and negatively charged electrons like a spray of water shaken from a wet dog.

The positively charged ions are dissolved in the acid, while the negatively charged electrons surge toward a positively charged carbon rod. Along the way, the electrons run a gauntlet through the circuitry of your electronic device, providing the electricity necessary to play music, light up screens, and capture photo images. After the rendezvous with the carbon rod, the electrons return back from whence they came, recombining with the ions in the sulfuric-acid stew.

Where is all this action taking place? Inside the humble battery.

Let's break it down: Batteries are a series of galvanic cells that convert chemical energy into electricity. ("Galvanic" means capable of producing electricity.) When you connect the positive and negative terminals of the battery (which is what you're doing when you turn on your digital device), you're allowing the electrons to flow out of the negative terminal, shoot through your device, then return to the positive terminal. Until the positive/negative connection is made, the chemical reaction doesn't take place. That's why batteries can be stored without completely discharging—unless their circuits are completed, the chemical constituents remain largely inactive.

To create a galvanic cell, you need three ingredients: an anode (that is, a negative terminal), a cathode (otherwise known as a positive terminal), and an electrolyte solution that promotes the transfer of electrons. In the example above, zinc is the anode, carbon is the cathode, and sulfuric acid is the electrolyte. All metals or metallic compounds have varying degrees of electromotive force—that is, a propensity to swap electrons with another material. So to create the *ultimate* battery—one with the most power and the longest life—you'll want to choose an anode with the most positive electromotive force, and a cathode with the most negative electromotive force. Of course, you'll also have to factor in the cost of the metal, the relative amount of the substance needed for a good reaction, how dangerous the material is to handle, and so on. Lucky for you, trial and many explosive errors have already yielded some favorable combinations. And chances are, you've got every single type of sensible chemical combination—in one form or another—in your home already.

Let's take a look at how the most popular batteries used in PCs and PC peripherals are brewed.

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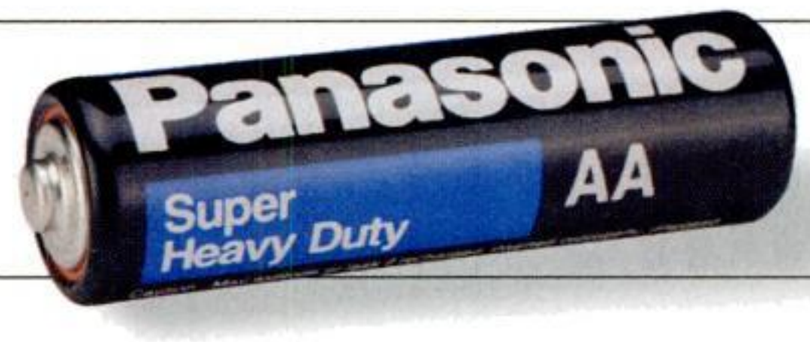
Zinc Carbon



Zinc-carbon batteries—also known as Leclanché cells after the man who invented the first dry cell battery—are referred to by manufacturers as "primary batteries." This category includes all batteries that are designed to be used just once until completely discharged and then discarded. Zinc-carbons are the least expensive batteries you can buy at the drugstore. In fact, they're becoming hard to find as inexpensive and longer-lasting alkaline batteries squeeze them out on the shelves. Still, they're cheaper than alkalines, and they have the distinction of being the first widely available household battery.

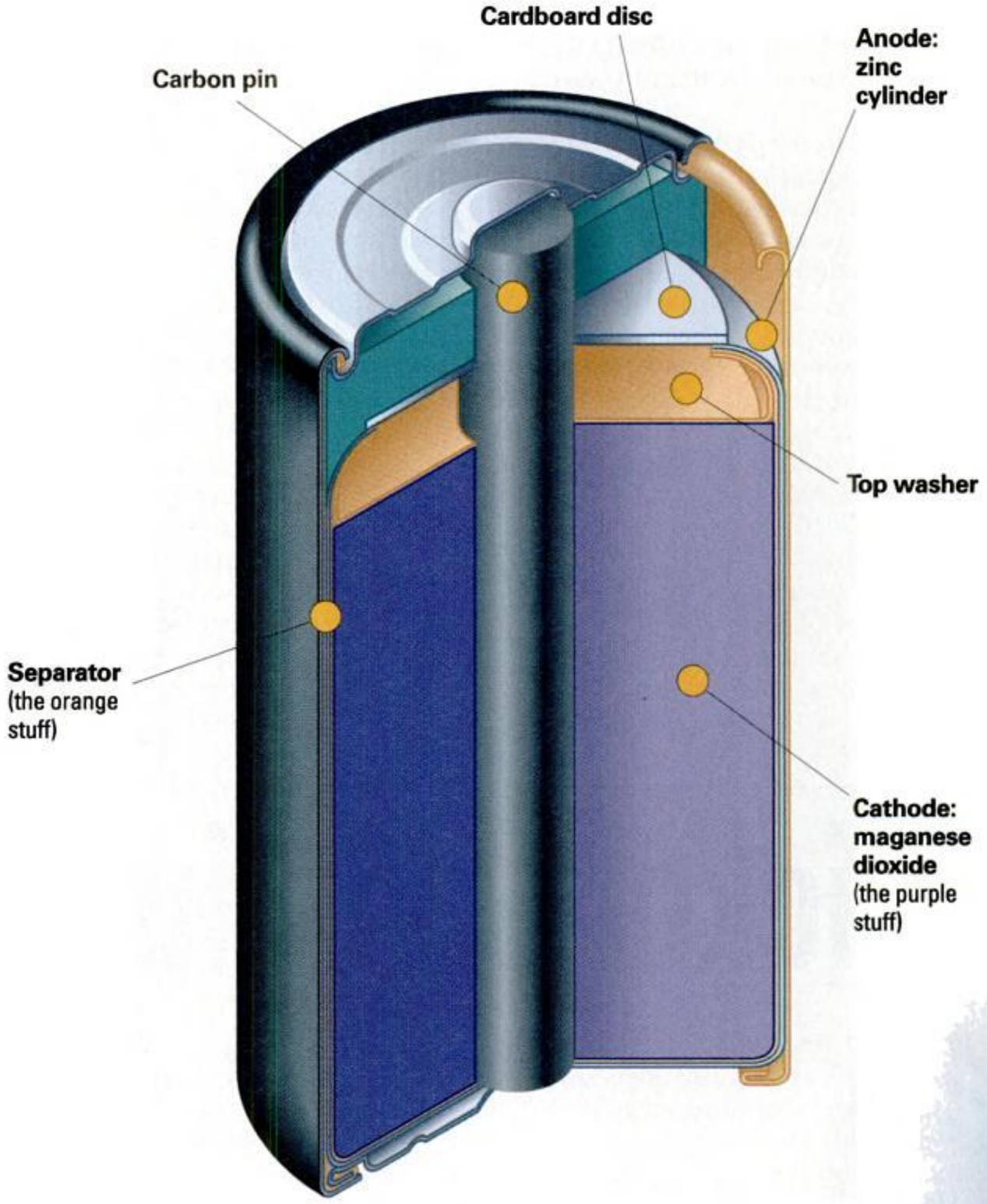
Zinc-carbon cells use everyday zinc as the anode, and manganese dioxide is the cathode. The main component of the electrolyte is sulfuric acid. These are also known as "dry cell" batteries because the electrolyte solution is either in a dry, powdery form, or immobilized by a gel or absorbent diaper-like material. Because "wet cells" (with liquid electrolytes that slosh around inside them) are almost exclusively used in automobiles, we won't worry about them here.

Zinc-carbon batteries typically have a nominal voltage of 1.5V. But wait, you say, what about 9V zinc-carbon batteries? This is why they're called batteries: Almost all of these batteries contain multiple galvanic cells arranged either in a series (to deliver higher voltage), or in parallel (to deliver a longer-lasting current). If you dissect a 9V battery, you'll find six 1.5V cells bunched together like a can of Vienna sausages.

They're cheap alright, but zinc-carbon cells are saddled with a sloping discharge curve, meaning that the voltage level will decrease as the battery is gradually discharged. That's why flashlights that use zinc-carbon batteries will become dimmer the longer they are used. Zinc-carbons should never be used in devices that require steady voltage, as they will conk out long before the battery is actually drained.

Care and Feeding

Zinc-carbon batteries digest the zinc anode from the inside out. Sometimes, this process doesn't happen evenly around the interior of the battery as it should, and the acid will dissolve right through the zinc casing and insulating layer, leaking into your device and causing mayhem. So remove your zinckies when not in use.



The sulfuric acid electrolyte in the zinc-carbon battery permeates the entire structure of the cell. And despite the presence of the insulating sleeve, these batteries are still prone to leaking sulfuric acid, which smells terrible and can burn skin. Zinc-carbon batteries aren't rechargeable, but at least they're cheap.

POSITIVES & NEGATIVES

+ The first, and still the cheapest, household battery. Relatively low self-discharge rate.

- A sloping discharge curve and leakage-prone case make zinc-carbons unsuitable for expensive electronics.

Betcha didn't know: In 1760, John Wesley published *The Desideratum,* or *Electricity made Plain and Useful by a Lover of Mankind and of Common Sense.* This gripping page-turner advocated the use of electricity for various ailments, from toothaches to blindness. Eventually, electricity therapy expanded to include restoring drunkards to sobriety, curing leprosy, and curbing excessive appetites. Of course, we have no use for such pseudo-science today. But, by the way, what's your sign?

In the late 1700s, Luigi Galvani noted that a frog's leg would jerk when the nerves and muscles were put in contact with two types of metal. He deduced from this that animals generated electricity. Count Alessandro Volta, however, wasn't buying it. He stacked discs of silver and zinc, separated with wet pasteboard, to prove that it was the reaction between the metals that generated electricity. So Count Volta is credited with creating the first battery, even though Galvani got his name on the galvanic cell.

Alkaline

If prizes were given for ubiquity alone, the classic alkaline battery would surely be a winner. You find them in all shapes and sizes, you can pick them up virtually anywhere, and they can be stored for up to 10 years without losing more than 15 percent of their charge.

Alkaline batteries use a zinc anode and a manganese dioxide cathode. But instead of the acidic electrolyte used in zinc-carbon batteries, they use an alkaline zinc-chloride electrolyte. Alkaline batteries are far less prone to leakage, so they make better companions to flashlights stored in a drawer over time for emergencies. Alkies last five to six times longer than zinc-carbon batteries, and have a more stable discharge curve.

Like zinc-carbons, these are primary cells, though some manufacturers have been offering rechargeable alkaline batteries. Recharging these cells, however, is limited to just 25 cycles or so. Hardly worth the investment.

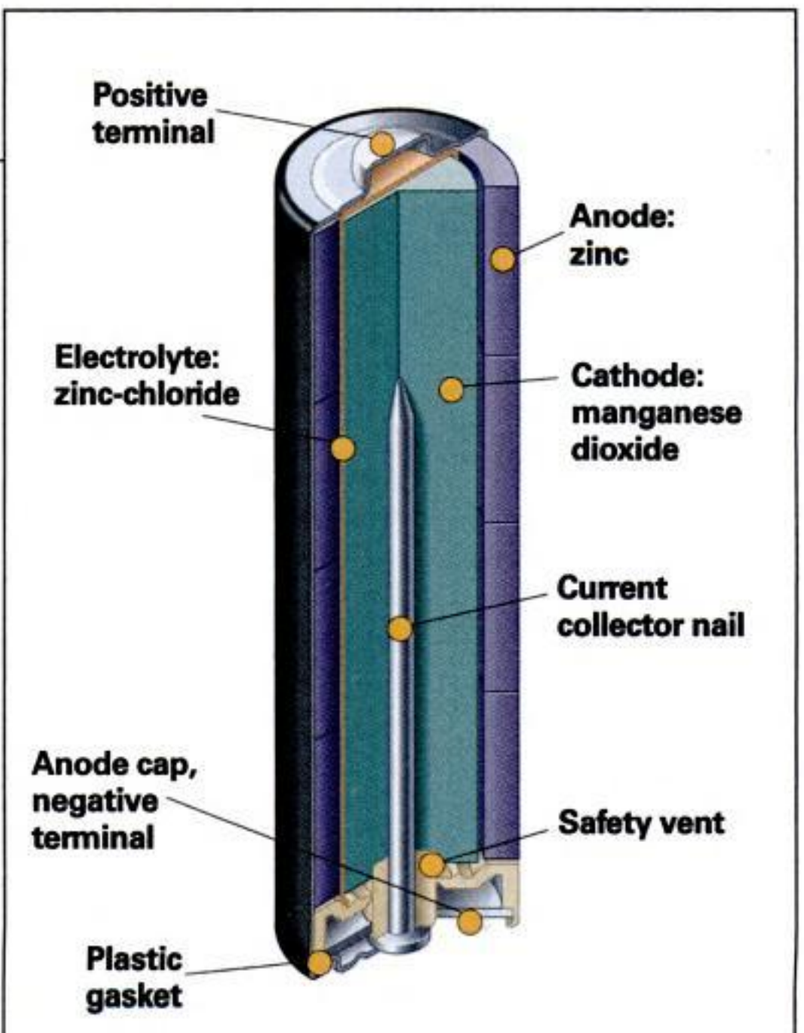
Care and Feeding

There isn't much you can do to extend the life of a standard alkaline battery, other than not keeping it loose in a drawer (metal may come in contact with both leads, thus shorting out the battery). While some manufacturers pooh-pooh the idea, many others agree that refrigerating batteries will extend their shelf life, based on common sense: Cold slows down chemical reactions, and heat speeds them up. Just remember to let the batteries come to room temperature before using them—they won't supply the necessary voltage until they've warmed up. If you've ever tried to start your car on a freezing morning, you know what we mean.

POSITIVES & NEGATIVES

+ Inexpensive, lasts five to six times longer than zinc-carbons when powered up, and has a long shelf life when not in use.

- The sloping discharge curve is not as severe as that of zinc-carbons, but is still poor.



The alkaline battery includes a safety vent near the negative terminal. In the rare event that excess hydrogen gas emitted by the anode/cathode reaction builds to dangerous levels, the vent provides a release valve.

Nickel Cadmium

Manufacturers refer to nickel-cadmium batteries as secondary batteries—in other words, they're designed to be recharged by reversing the electron-transfer process. One advantage of "Ni-Cad" batteries is their relatively flat voltage profile. Unlike zinc-carbons and alkalines, Ni-Cad's will provide relatively constant voltage for over two-thirds of their discharge cycle. But after that, voltage drops sharply, and depending on your voltage requirements, your device will either perform erratically, or not at all. For this reason, you'd be screwed to find them bundled with a digital camera. Nonetheless, nickel-cadmium batteries are the most common household rechargeable batteries, and they can be used in any device that would accept a comparable alkaline.

Cadmium, unfortunately, is highly toxic. Throw a Ni-Cad battery in the trash today, and your granddaughter could be spooning cadmium out with her Cheerios tomorrow. Contact the Rechargeable Battery Recycling Corporation (RBRC) at 800.8BATTERY for advice on recycling your old rechargeables.

Care and Feeding

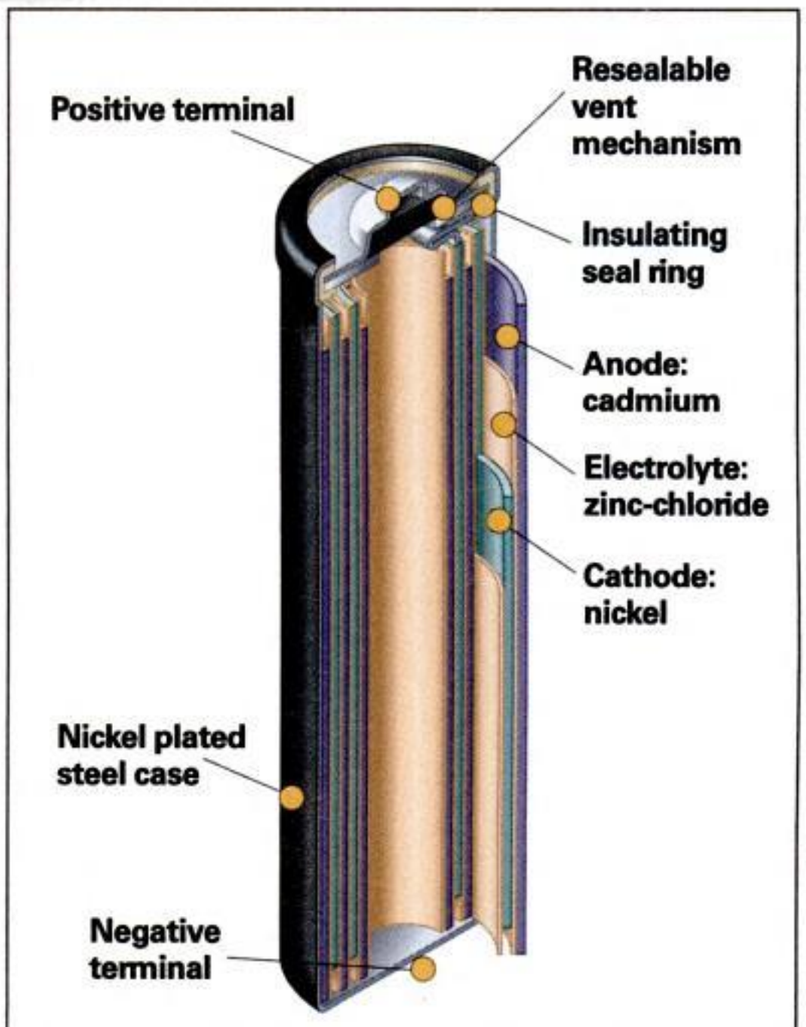
Ni-Cad cells—particularly the ones used in old-school notebooks—are notorious for the dreaded "memory effect." The memory effect occurs when the battery is only partially discharged before being recharged again. If the partial discharge process is repeated several times in a row, potassium-hydroxide crystals form inside the cells. The crystals don't dissolve easily, thus they grow and grow between every partial discharge/recharge, and reduce the battery's overall capacity. It's like an old freezer that collects frost—the more frost there is on the interior, the harder it is to defrost the freezer. And as the frost continues to build, you'll have less capacity inside the freezer.

To some extent, Ni-Cad memory effect can be kept in check by using the controlled power cycling offered by the more expensive rechargers (look for the word "conditioner" on the label). Before juicing up the battery, the recharger sucks it completely dry to remove the possibility of a partial discharge before the recharge. Just be aware that Ni-Cad batteries have a maximum recharge limit of about 800 to 1000 cycles.

POSITIVES & NEGATIVES

+ The least expensive form of rechargeable batteries, available in every standard battery size on Earth. Nice, flat voltage profile.

- Extremely susceptible to the "memory effect." Contains highly toxic cadmium.



Recharging any kind of secondary battery, like the nickel cadmium cell shown above, requires that the chemicals formed during cell discharge be able to efficiently and safely convert back to the original electrode materials that they started as. Supplying an electric current to rechargeable batteries literally reverses the process of turning chemical energy into electricity.

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Nickel Metal Hydride

Nickel-metal hydride batteries can last up to 40 percent longer than nickel-cadmium batteries. That figure alone is enough to propel them into electronic stardom, where the length of time you can go without recharging is a crucial factor. Additionally, the metals used in the recipe for Ni-MH batteries are far less prone to the "memory effect" that results from crystallization within cells. Thus, you're likely to find Ni-MH batteries if you pry open your high-end camcorder, cordless phone, and cellular phone.

Ni-MH batteries have a life span of around 600 cycles. That's considerably less than Ni-Cads, but keep in mind that each charge lasts longer. And it's not as if the whole battery crumbles after the counter rolls past 600. Around this time, the component materials will gradually lose their ability to transfer electrons, and the battery will no longer be able to hold a full charge.

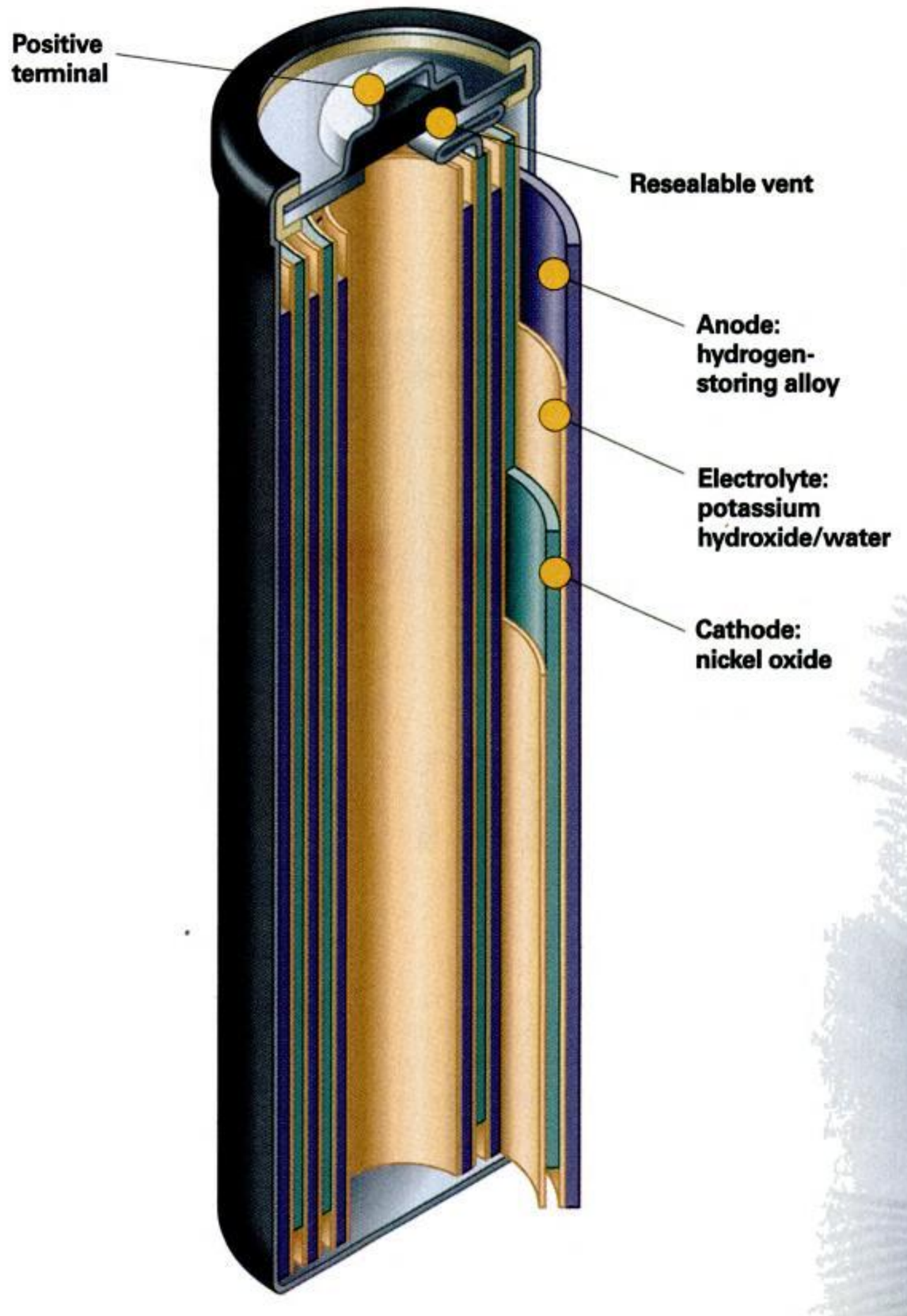
Nickel-metal hydride cells use hydrogen-absorbing alloy metals as their anode, and nickel hydroxide as their cathode, with potassium hydroxide (an alkaline) as the main electrolyte material. Like most advanced batteries, Ni-MH batteries also integrate a safety vent that literally "burps" the battery in the event of a buildup of gas by-products (the vent can even seal itself back up).

Ni-MH batteries—like most other cells—should have their voltage and current rating displayed right on the case itself. The current rating is expressed in milliamp-hours (mAh), which tells you that the battery should last one hour for every multiple of 1000 mAh in the rating. This equation assumes maximum power draw whenever the battery is in use, so, naturally, it doesn't accurately correspond to the actual useful life of the battery—a single device doesn't always draw the same amount of current. But a battery with a higher mAh will definitely last longer than one with a lower rating.

Ni-MH cells don't contain poisonous heavy metals like cadmium. Even if you couldn't give a hoot about the environment, their benign nature is still a plus because they have low hazardous-waste disposal requirements, and this brings their price down somewhat.

Care and Feeding

If you're deeply invested in Ni-MH cells, it will probably pay off to get a "smart" charger, a device that mitigates the heat and overcharging that can drastically shorten the life and capacity of Ni-MH cells. Smart chargers contain microprocessors that constantly monitor the voltage, and sometimes the temperature, of cells being charged. When the batteries reach their full charge, the charger will go into "trickle" mode, delivering only tiny bursts of energy at intervals to keep the battery at its full capacity until it's removed from the charging unit. You can pick up a smart charger at Radio Shack (www.radioshack.com), or any decent electronics store.



Although they contain different chemicals, nickel-metal hydride cells generally don't differ in design from nickel-cadmium cells. They both have the layers of anode, cathode, and moist electrolytic separator wrapped in nickel-plated steel. And they both have the "burpable" vent.

POSITIVES & NEGATIVES

+ Longer lasting than Ni-Cads, and suffer far less of a memory effect.

- Offer fewer recharge cycles than Ni-Cads, and have a slightly higher self-discharge rate to boot.

Here's an alarming tip on the disposal of lithium batteries, courtesy of the Naval Safety Center at www.safetycenter.navy.mil: "At sea, dispose of batteries overboard in deep water (in excess of 100 fathoms) outside the prohibited zone (50 mile limit). In port, dispose of ashore in accordance with federal, state, and local base environmental regulations for used hazardous material." Long story, short: The environment matters—but only when someone's watching. Look out, Willy!

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Lithium-Ion

Lithium is the lightest solid substance on earth. It's also the metal with the strongest positive electromotive force and highest energy density (that is, the ratio of cell energy to the cell's weight or volume). But the same chemical properties that make Li-Ion so ideal for portable power also make it extremely dangerous to manufacture. If lithium comes in contact with water—boom. If lithium melts and comes in direct contact with the cathode—boom. So most manufacturers have experimented with using extracted lithium ions as the anode, and compounds such as manganese dioxide and iron sulfide as the cathode. The result is a less powerful, but far safer, battery.

The relative efficiency of the lithium-ion cell allows manufacturers to pack more power into smaller cells. You'll find primary and secondary lithium-ion cells just about everywhere. The battery backing up your PC's precious CMOS information is almost certainly a lithium-ion button cell. Digital cameras, DV cameras, some MP3 players, and most laptops today benefit from the combination of light weight and high energy density that lithium-ion cells provide.

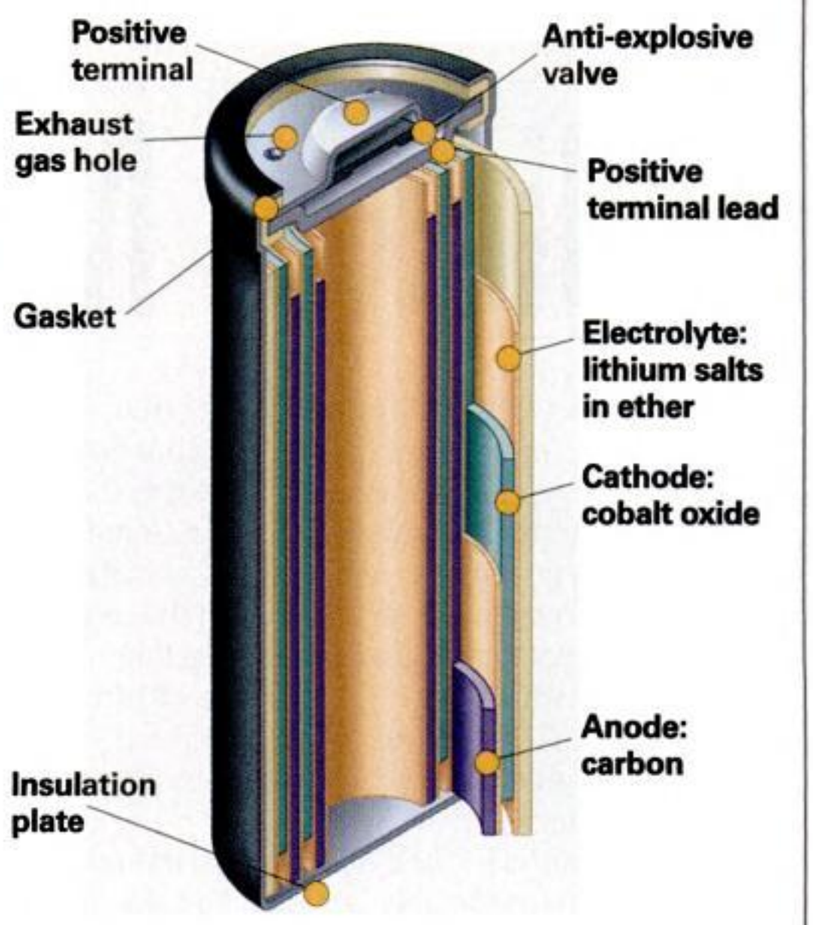
POSITIVES & NEGATIVES

+ Superlight, and able to hold more energy than any other cell.

- If the lithium inside the battery comes in contact with water, it can mess you up bad.

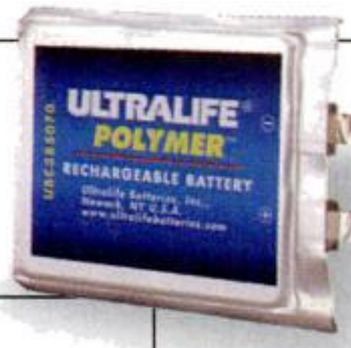
Care and Feeding

Li-Ion cells don't suffer from the memory effect and require little nurturing. The same cannot be said of the original lithium cells found in older motherboards and conventional film cameras. If you happen to be walking by the Maximum PC Lab and hear an explosion as a result of lithium battery experiments, *please* do not squirt us with a common water-based fire extinguisher (check the label; A, B, and C class extinguishers are all water-based). You'll just make the fire much worse. Instead, look around for a D class extinguisher intended for use on reactive metals. Thanks!



Lithium-ion cells are manufactured in the cylindrical form-factor you see above, and also in a thinner, flatter rectangular shape. These cells are called "prismatic," and though they have slightly less energy density, their shape makes them better suited to slim laptops and portable phones.

Lithium Polymer



Lithium polymer (also known as a polymer lithium-ion battery, or PLB) adds a very unique characteristic to the lithium battery repertoire. Unlike traditional batteries that use an electrolyte-soaked separator inside a hard metal casing, lithium polymer batteries use a dry, film-like separator inside a flexible plastic or aluminum laminate foil. Thus, Li-Po batteries can be molded to fit a variety of custom shapes (gently, though—lithium polymer batteries can't be squished or bent sharply). Apple's iPod, for instance, owes its light weight and tiny size to a lithium polymer battery molded to the bottom of the player. One unfortunate side effect of PLBs is their tendency to swell under high heat.

A variant of the lithium polymer design is Toshiba's ALB (advanced lithium battery). ALBs are also somewhat malleable, but employ old-school semi-liquid electrolyte chemistry to reduce the likelihood of swelling. Both Li-Po types are still fairly expensive, but prices are expected to come down once they're integrated into more devices and production ramps up.

The unique properties of lithium polymer cells make them particularly well-suited for devices at the high end of their categories; mobile phones, PDAs, and soon, slimline notebooks.

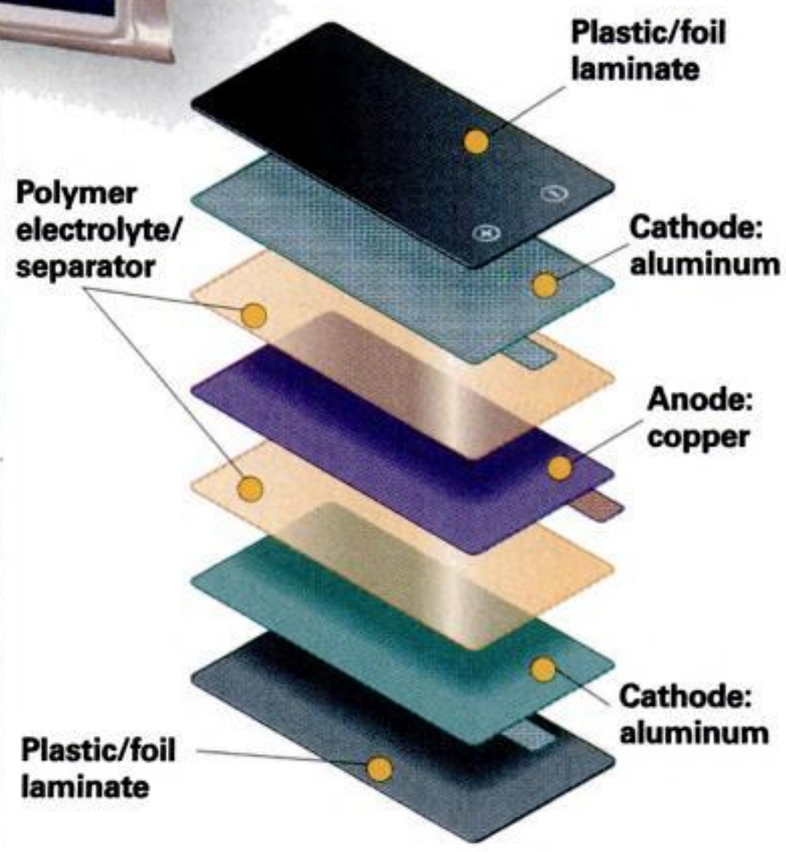
POSITIVES & NEGATIVES

+ Extremely thin packaging and truly flexible design.

- Lower energy density than lithium-ion cells. Very expensive.

Care and Feeding

Unlike the other cells we've looked at, you can't buy lithium-polymer batteries off the shelves in their naked form. They're built into electronic devices, and once you pull them out, most likely you'll never get them back in. But it can't hurt to keep devices powered by ALBs or PLBs out of very hot environments, which diminish their life span.



In the prismatic form you see here, lithium polymer cells make the most efficient use of their anode by sandwiching it between two cathodes, which use both sides of the anode element simultaneously.

Are fuel cells all wet?

Hmm… a battery that never needs recharging, uses no dangerous chemicals, and emits only water as a by-product. Sound good? That's the fuel cell for you, the latest panacea on the portable power circuit.

Fuel cells operate on much the same principles as the galvanic cell. Electrons are peeled away from hydrogen (the anode), providing the cell's power. When they return to the oxygen cathode, the fusion of the hydrogen electrons and the oxygen protons creates water, the only emission from this type of cell.

But manufacturers guess it could be nearly a decade or more before miniaturized fuel cells (like the prototype you see here) are peeing in your pocket. ■

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Creatures attacking: 49,438

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How To...

A step-by-step guide to tweaking your PC Experience

QUIET THE VACUUM CLEANER YOU CALL A PC

Silencing tricks for a more peaceful PC experience, in less than an hour's time.

MAXIMUM PC
TIME TO COMPLETION
00:45
HOURS MINUTES

BY JOHN TUMMINARO

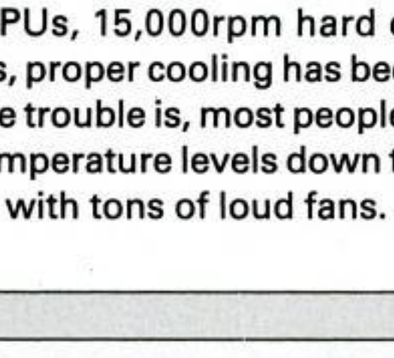
Once upon a time, your average PC builder worried about excessive heat about as much as people in Antarctica do. PCs of yore didn't run all that hot, so only minimal cooling was required. But in today's world of 2GHz CPUs, 15,000rpm hard drives, and GeForce4 videocards, proper cooling has become essential for any system. The trouble is, most people worry so much about keeping temperature levels down that they sacrifice their tranquility with tons of loud fans.

If you want to quiet a noisy PC, there are some things you can do to knock off a few decibels and make your PC sound a little less like a nuclear reactor. The following three tips are stand-alone, so you can do as many or as few as you feel comfortable with.

Keep in mind that quieting your PC *will* increase your case temperature. If you're planning on overclocking your PC you might look to more exotic techniques such as water cooling.

What You'll Need

- Papst 80mm 8412-NGL fan (www.plycon.com, $20)
- Noise Control Magic Fleece (www.plycon.com, $60)
- PC Power & Cooling Silencer 400 ATX (www.pcpowerandcooling.com, $160)
- Foam padding or standard air-conditioner filter
- Felt pen
- Sharp scissors
- Ruler or measuring tape
- Phillips-head screwdriver
- Duct tape



(Fleece)

(foam)

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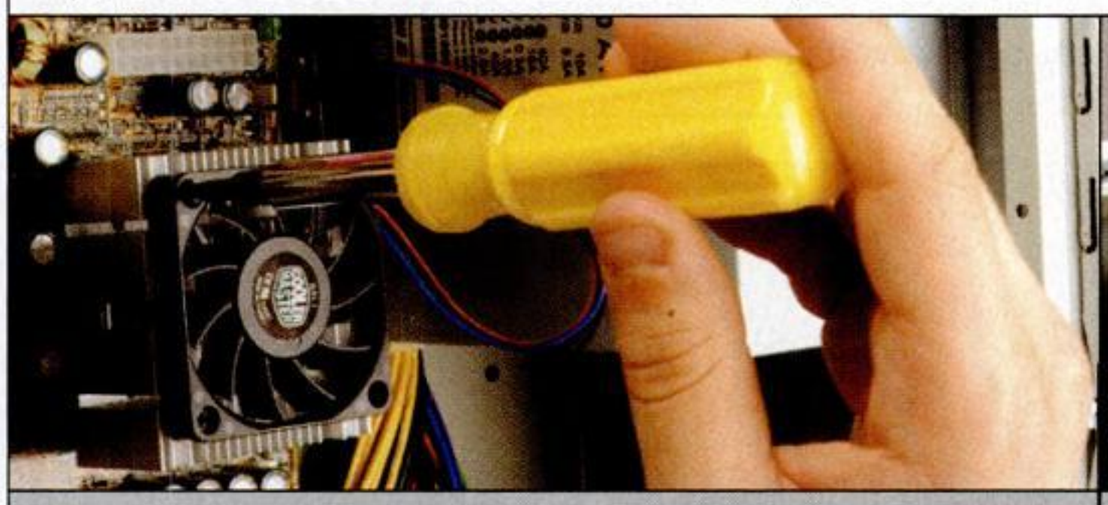
Fan, Fan, Thank You Fan

The biggest contributor to noise in any modern system is the fans. Adding a superquiet hard drive or power supply won't quiet your PC at all if you don't also do something about those bloody fans. The problem is that, as a general rule, quiet fans don't move as much air as loud fans, so they're less effective at cooling your hot PC. The trick is to find the balance between noise and heat. For our PC we tested the 80mm Pabst fans that are sleeve-bearing and run at a superquiet 12dB, but move just a paltry 19.5 cubic-foot/minute (CFM) of air. At the other end of the scale would be the 80mm overclocker Delta fan that puts out an amazing 80CFM of air, but at a deafening 52.5dB. Remember that the decibel scale is logarithmic not linear. A 6dB sound is twice as loud as a 3dB sound, but a 9dB sound is twice as loud as a 6dB sound. Funky, ain't it?

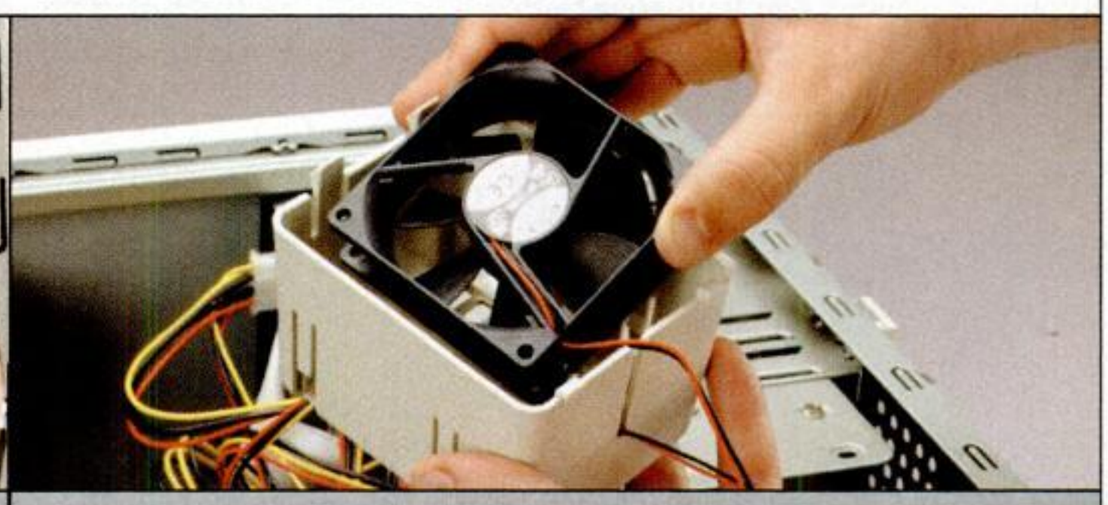
Buy a better fan

First take stock of your case's cooling system. Determine which fans you want to replace with quieter ones. Measure them diagonally to determine the fan size before ordering replacements (most case fans are 80mm, while most CPU heatsink fans are 60mm).

Next, locate the retention mechanism (either screws or plastic clips) and remove them. Then disconnect the fan power cable from the source, either the motherboard or a 4-pin Molex, and remove it from the case. Install the new fan by securing it with the retention mechanism, then plug it into either the motherboard or 4-pin Molex. Make sure the fan is blowing in the correct direction—most fans have small arrows on one side that show both the direction of airflow and the rotation of the blades.



➤ Take care not to start up your PC while the CPU fan is unattached. You'll be able to roast tamales on the heatsink if you do.

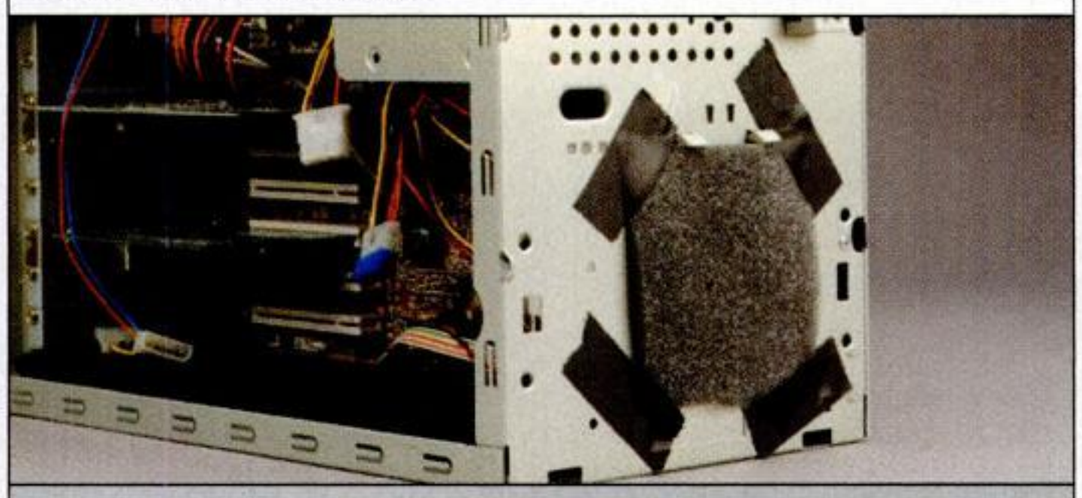


➤ This is a typical clip mount system for an 80mm fan. They're not standardized, so make sure you know what you're doing before you try to swap fans.

Filters look hooptie, but they work

Filters are a cheap way to reduce noise while keeping the inside of your case dust-free. First, find the appropriate material; we used the foam padding that came with our motherboard box, but you can buy cheap air filters at almost any hardware store that'll do the same thing.

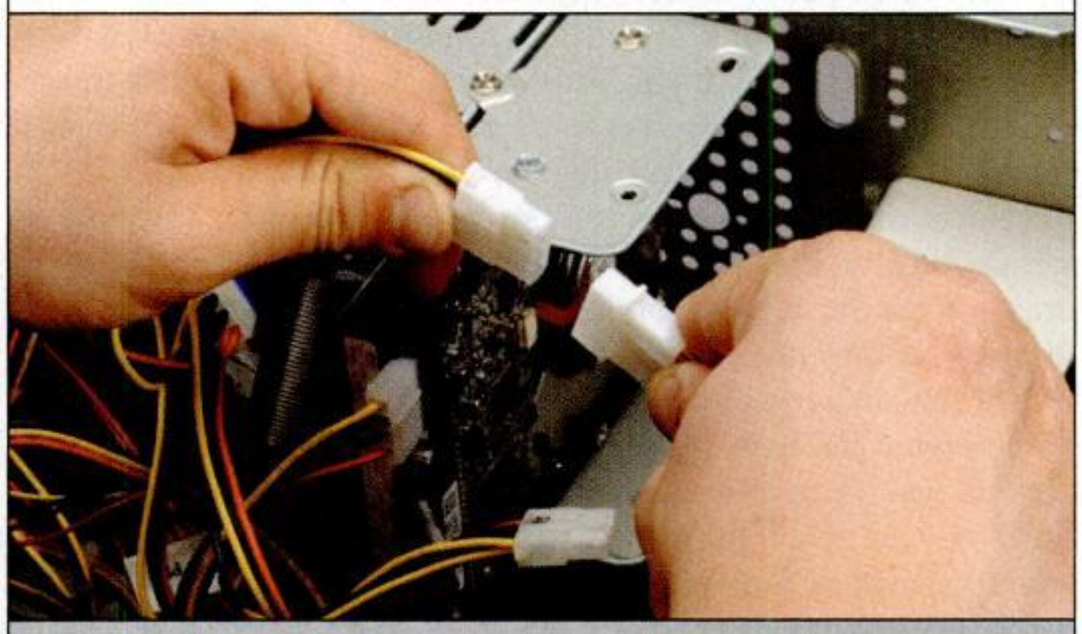
Next, cut a square section of your filter material to go over your fan's air hole. Then simply apply tape (duct tape works best). You can either mount the filter on the inside or outside of the case, but if it's outside, make sure it's underneath the case panels to prevent your case from looking like a pile of shtick. You may need to use more than one layer if the material is thin, but verify that there's adequate airflow by placing your hand in front of the filter while the fan is blowing.



➤ It may look undignified, but making a filter is highly effective and won't break the bank.

Disable those extraneous fans

If you feel like your case is stacked with a few too many fans, you can always remove or disable a couple. To do this, simply unplug the fan's power connector from the motherboard, or the power supply if you're using a 4-pin plug. To remove the fan, either unscrew it or unclip it from its mount and simply pull it out. It should be said that unless your case is absolutely jammed with fans, it's probably best to replace the fans with quieter ones rather than taking them out altogether. But if you're on a budget and your CPU temps are south of 100° F, it won't hurt to excise a few of these little noisemakers.



➤ Don't go crazy and pull every single fan unless you want to start booking beach vacations inside your case.

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Sound Dampening—Add a Little "Magic" to Your PC

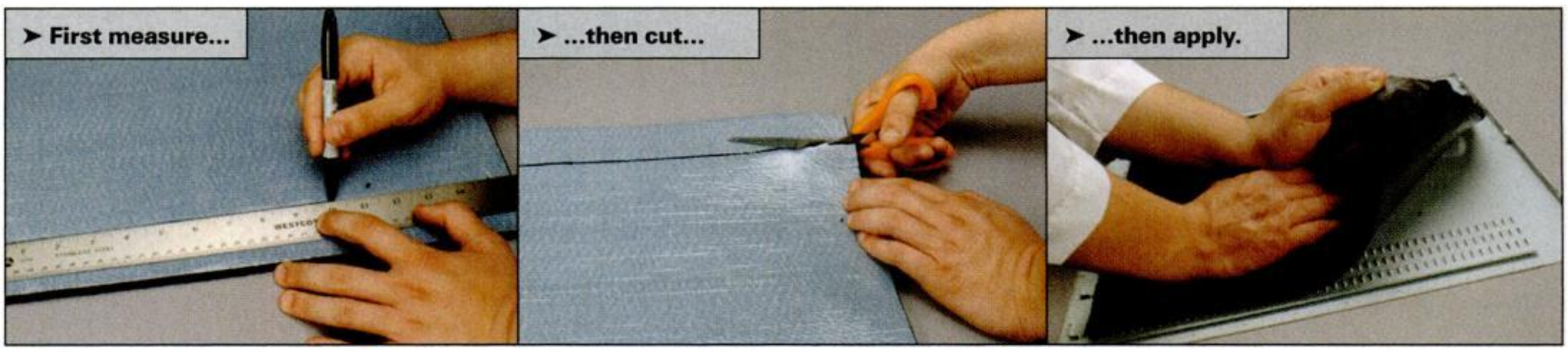
Noise-dampening materials work by absorbing sound, keeping noise inside your case, where it belongs. European manufacturer Noise Control meets this need with Magic Fleece—a polyester microfibre specifically intended for quieting a noisy PC. Magic Fleece can greatly reduce your PC's noise levels, but at the price of higher case temperatures.

Before you begin, you'll want to make sure the airflow in your case is adequate. The catch is that installation of the Fleece is pretty much permanent. We recommend taping the material to your case before you install it permanently, so you can make airflow adjustments if your PC overheats. Why use Magic Fleece instead of the cheaper Dynamat? Dynamat smells bad and Magic Fleece doesn't.

First decide which sides of your case you want to apply the Magic Fleece to. We recommend hitting both sides and the top. Then measure the dimensions of the piece you're going to apply. Make sure that when covering side panels you take pains not to cover pieces that affix the panel to your case. You should also make sure you have enough room between the side panel and the motherboard tray. Magic Fleece is 12mm thick and doesn't fit in many cases without some adjustments.

Once you have the measurements of the sheets you need, use a felt pen to mark your cut out on the plastic covering the adhesive side of the Fleece. Then use scissors—sharp ones, this stuff is hard to cut—to cut your desired segments.

Next you'll want to lay the surface of the case panels flat and mark with a felt pen where the corners of the sheet will be placed. Then remove the plastic adhesive cover and apply the sheet, corners first, to the panel. Be very careful—this stuff is an absolute nightmare to reapply, so take care to do it right the first time.



Power Supply Replacement

A power supply replacement is a nifty way to take your PC's noise level down a notch, but it's not for the faint of heart. Replacing a power supply is a major system upgrade, on par with a motherboard replacement. The PC Power & Cooling's Silencer line of power supplies are reliable, really quiet, and can be had with up to 400W total output.

First open your PC's side panel, and put the case open-side up on a table. Locate all the power connections to your current supply and remove them; this includes optical drives, hard drives, floppy, fans, and the big 20-pin connector on the motherboard (plus possible 4-pin 12v connectors for P4 systems). You might want to write down the number of connections you're disconnecting so you won't miss any when you plug them back in. Next, locate the four screws on the back of the PC that are holding the power supply in place, and remove them. Then simply pull the supply out of the case making sure not to snag anything.

To install the new supply, put it in the case where the old one was. Then make sure that the four screw holes line up; if they do, screw them in. Next reconnect all the power leads you just unplugged. Take your time and make sure you reconnect everything, or else your stuff won't function. After you do that, power on your PC and make sure all the drives are recognized and all the fans are spinning.

➤ If you're using the power supply that came with your case, you might be able to upgrade to something quieter.

Conclusion

To test the effect your changes have had on your noise levels, take your PC into a quiet room and close the door. Then power it up and see how much quieter it has become. The test PC we quieted sounded like a Dustbuster mini-vac before we worked on it. Afterwards, it was near whisper quiet, and the CPU core ran a substantial but not extreme 21° F hotter than it had before (going from 101° F to 122° F). ■

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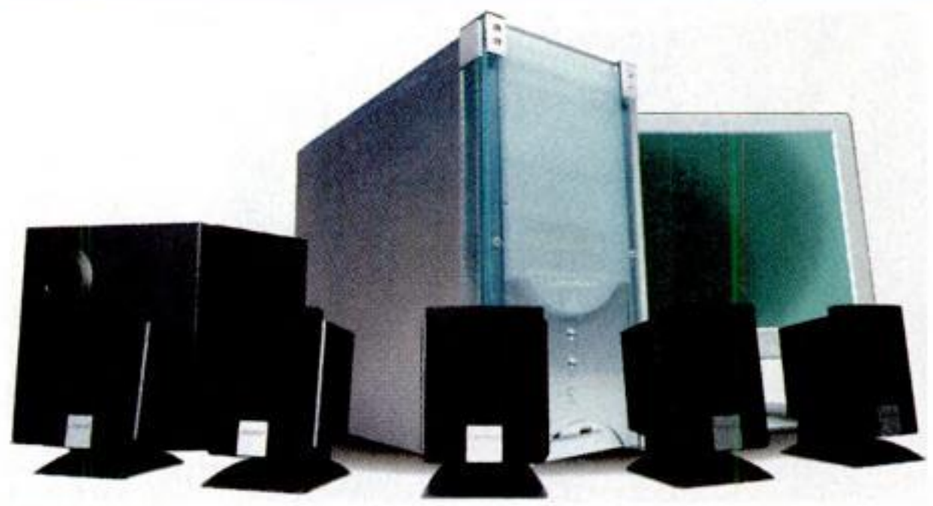

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In the Lab

A behind-the-scenes look at Maximum PC testing

Maximum PC Benchmarking Guide

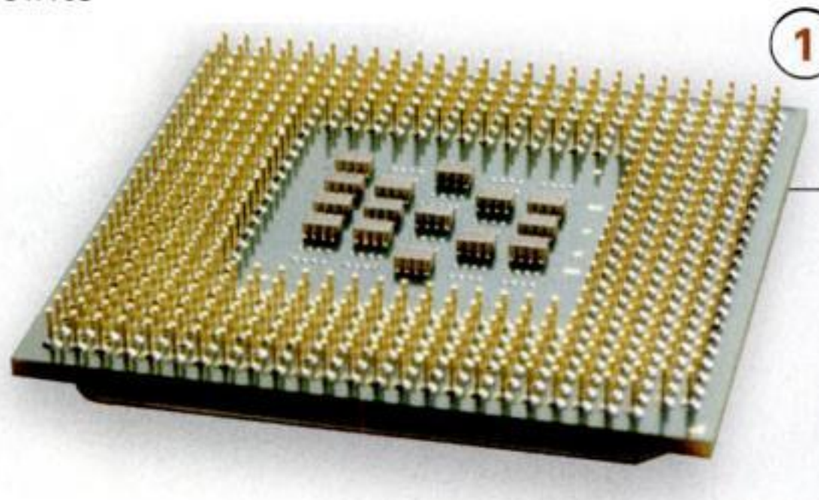
Bigger, faster, and better: new tests, new zero-points

It's that time of the year again: We're instituting new test beds, new benchmarks, and a new level of PC punishment.

If you're not hip to our benchmarking scheme, here's your crash course: All Lab testing centers on our personally configured "zero-point" systems—five identical rigs that provide a level of baseline performance against which all vendor review systems are compared. So when we review a new OEM rig, we check its benchmark scores against the zero-point scores and render our cruel verdicts accordingly. We also use our zero-point systems for component reviews: All videocards, CD burners, and what have you are tested in the exact same desktop configuration. This isolates the performance of the component being reviewed, helping us render the fairest evaluations possible.

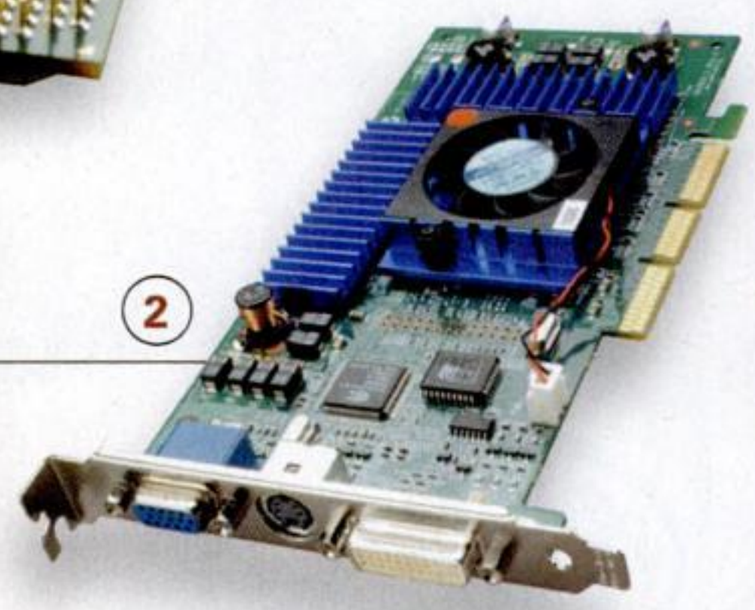
Of course, our benchmarking program suffers from an obvious problem: The zero-point systems quickly grow obsolete! Periodic refreshes are always necessary, thus the new rigs and benchmarks we're revealing this month. For information on our notebook zero-points, as well as a full disclosure of all the benchmarks we use for component testing, go to the Benchmarking guide at MaximumPC.com.

The following components are stuffed into the same HP cases that hosted our last zero-point rigs. The new zero-point boxes don't represent the zenith of PC power, but they do represent the configs that most power-users currently have at home.



1

Intel's 2GHz Pentium 4
To ensure the best compatibility with alien components and apps, we're sticking with the Intel platform. Besides, with 512KB of L2 cache, the 2GHz is no slouch for today's games and apps.



2

Visiontek Extasy GeForce4 Ti 4600
A member of the fastest 3D accelerator family on earth. Its awesome power is evident in current fixed-pipeline games such as *Jedi Outcast*, and the card includes programmable vertex and pixel shaders for all those vaporous DirectX 8 titles that may or may not eventually arrive.

3

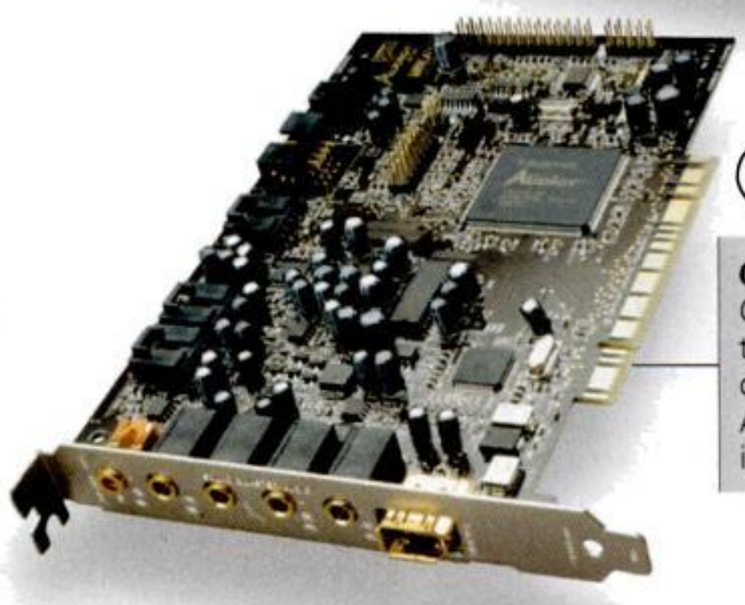
Western Digital 100GB 1000BB
With a 2MB cache and 7200rpm spindle speed, the 1000BB kicks a whole lotta ass. Packing an unprecedented 33GB on each of its three platters, the 1000BB spends less time digging around and more time reading and writing.

4

Lite-On 32x CD-RW
The speed gains from 40x write and 48x read drives are minimal, so we went with the inexpensive and dependable Lite-On 32123S. Great performance in every category—DAE, CD burning, and C2 error-correction reporting—makes it the perfect drive for our test systems.

5

Intel D850MV
If a third-party part can't work with an Intel motherboard, it probably won't work anywhere else either. We always use the most current chipset drivers, as well as Intel's Application Accelerator utility.



6

Creative Labs Audigy
Creative Labs continues to be the standard in consumer sound, so its Audigy soundcard reigns in our test beds.

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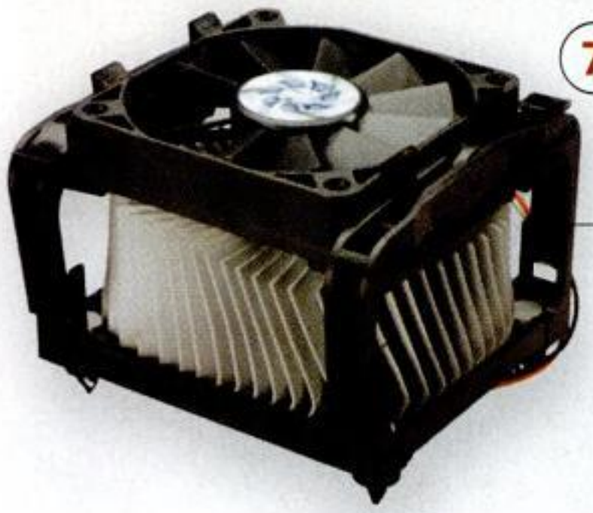
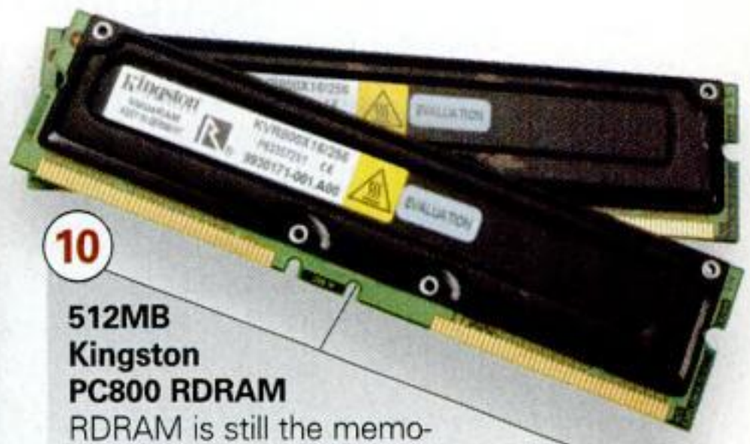


7

Sunflower
AVC's Sunflower uses unique extruded aluminum and a copper core to keep the P4 downright chilly. The fan clip breaks down into three pieces to make CPU swap-outs a snap.

Silencer 400 ATX Power Supply
The HP cases started with 250-watt power supplies, but we swapped in PC Power and Cooling 400W Silencers just to play it safe.

9



10

512MB Kingston PC800 RDRAM
RDRAM is still the memory to beat on P4 systems. We used a pair of 256MB RIMMs to fulfill dual-channel memory requirements.

Pioneer DVD-116
With low access times and 16x DVD-ROM read speeds, the DVD-116 takes over for its older sibling, the DVD-115, which starred in our previous zero-point systems.

8

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The Benchmarks

Just like ventriloquism and sushi rolling, benchmarking is a mysterious art that's easy to attempt, but difficult to master. It requires a great deal of patience, a bit of intuition, and a solid understanding of how software code hooks into hardware resources.

At *Maximum PC*, we do our best to use real-world benchmarks (as opposed to synthetic benchmarks) whenever possible. Synthetic benchmarks are merely loops of code specifically designed to isolate and test various system components. Although synthetic benchmarks can return an accurate profile of a system or component's potential, they often don't impart any useful information on how hardware will perform during everyday use. So, when choosing and developing new benchmarks, we always try to stick with real-world tests that use apps and games available on store shelves. The following benchmarks are used for all desktop system reviews.

SYSmark2002 provides an accurate, reproducible profile of total system performance.

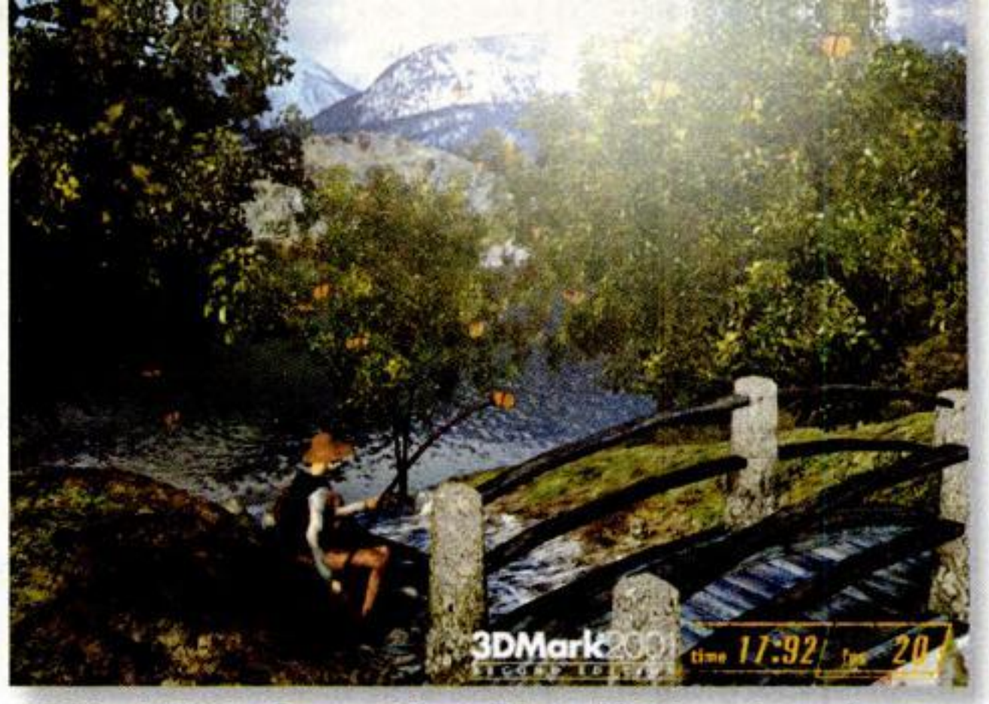
- *SYSmark2002* runs action scripts in 14 real-world applications, then spits out a cumulative score based on how quickly the system was able to complete its processing chores. If you're looking for a benchmark that hits your motherboard, CPU, memory, and hard drive, *SYSmark2002* is it.

The 14 apps are divided into two camps. The Internet Content Creation portion uses Microsoft *Windows Media Encoder*, Macromedia *Dreamweaver* and *Flash*, and Adobe *Photoshop* and *Premiere* to emulate the workloads of artsy-fartsy creative types. The Office Productivity portion uses Microsoft *Word*, *Excel*, *PowerPoint*, *Access*, and *Outlook*, Dragon *NaturallySpeaking*, Netscape *Communicator*, *Winzip*, and McAfee *VirusScan* to simulate the work of a typical office drone.

All *SYSmark2002* processing activity is timed, and to ensure the most accurate scores possible, the benchmark stops the clock while data is being auto-entered. For example, during the *Excel* portion of the test, the suite doesn't record the time required to fill the spreadsheet with numbers; it records only the time required to *crunch* the numbers. This is analogous to running a stopwatch on how long it takes your computer to crunch payroll, but not how long it takes you to enter all your employee data by hand. It's also important to note that *SYSmark2002* doesn't run its apps one at a time. It multitasks among them, mimicking the real-world activity of a power user. Go to **www.bapco.com** for details.

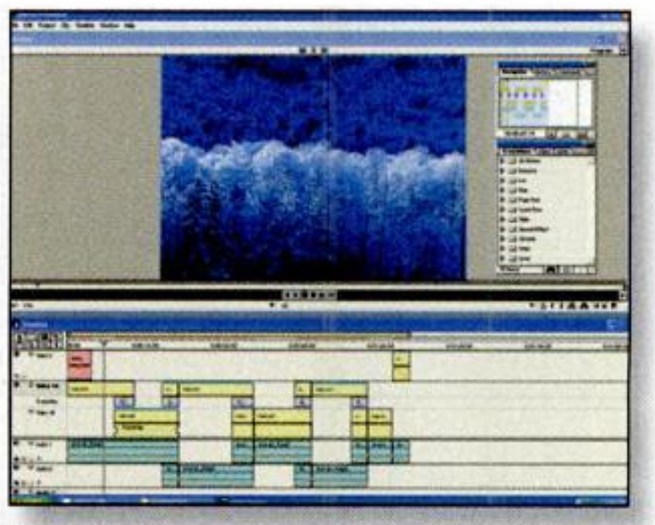
Each application time trial is assigned a performance score, and we report the cumulative score based on these numbers. Higher numbers indicate faster performance.

- Our own home-brewed Adobe *Premiere 6.01* script helps us gauge a system's video-editing capability (i.e., CPU, bus, and hard drive strength). We load a raw, 313MB AVI file, then time how long it takes *Premiere* to render a number of transitions, titles, and filters, and then encode the file with the Ligos *LSX-MPEG* encoder. In other words, we create video suitable for a DVD. Times are reported in total number of seconds; lower times are better.
- *Audiograbber* tests the digital audio extraction speed of optical drives, pulling just more than 70 minutes of audio from a commercially pressed disc. After we record the time in total seconds (lower times are better), we then listen to the first and last tracks, where clicks and pops are most likely to occur.
- *MusicMatch 7.1* tests the MP3 encoding speed of the CPU. For this test, we use a 5:47 track and encode it at 160Kbps, a rate that—strangely enough—takes much longer to encode in our tests than 128Kbps or 190Kbps. Go figure. Times are reported in total number of seconds; lower times are better.
- *Jedi Knight II: Jedi Outcast* tests a rig's ability in OpenGL gaming. This game presses the technical boundaries of John Carmack's *Quake III* engine, and the homegrown demo that we use for testing purposes boasts more onscreen polygons and particle effects than you'll find in other tests. Scores are reported in frames per second. Higher numbers are better.
- We use Game 4 in *3DMark2001 SE* to target the advanced vertex and pixel shaders of DirectX 8–compliant videocards. Technically, *3DMark2001 SE* is a synthetic benchmark, but Game 4 uses a real game engine to produce an idyllic country scene saturated with waving grass, flowing water, and butterflies. Scores are reported in frames per second. Higher numbers are better. Go to **www.madonion.com** for details.



***3DMark2001*: Game 4 is a DirectX 8 benchmark that uses both pixel and vertex shaders to test performance in next-generation games. Only systems with DirectX 8 videocards can run this benchmark.**

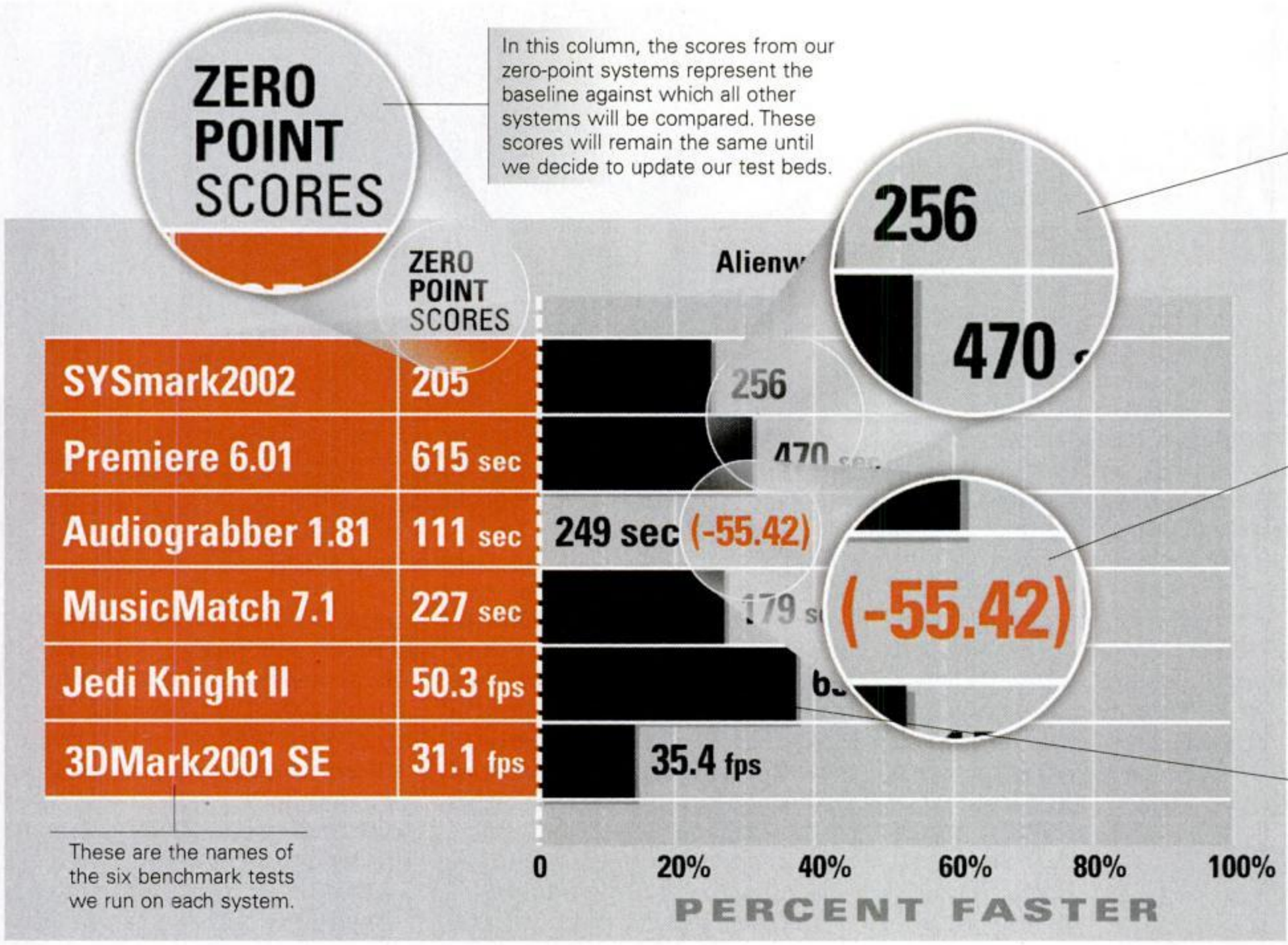
Packed to the gills with whirling lightsabers and bots aplenty, the demo we compiled using *Jedi Outcast* can bring your CPU and videocard to their knees. The demo runs on its own and reports a frame rate, thus once again proving that we don't just sit around playing games all day.



Our *Premiere* benchmark adds transitions and effects to a video clip, renders the video, then encodes it to MPEG2 using the Ligos encoder. It's floating-point heavy and relies on a fast CPU.

Copyrighted material

How to Read Our Benchmark Chart



In this column, the scores from our zero-point systems represent the baseline against which all other systems will be compared. These scores will remain the same until we decide to update our test beds.

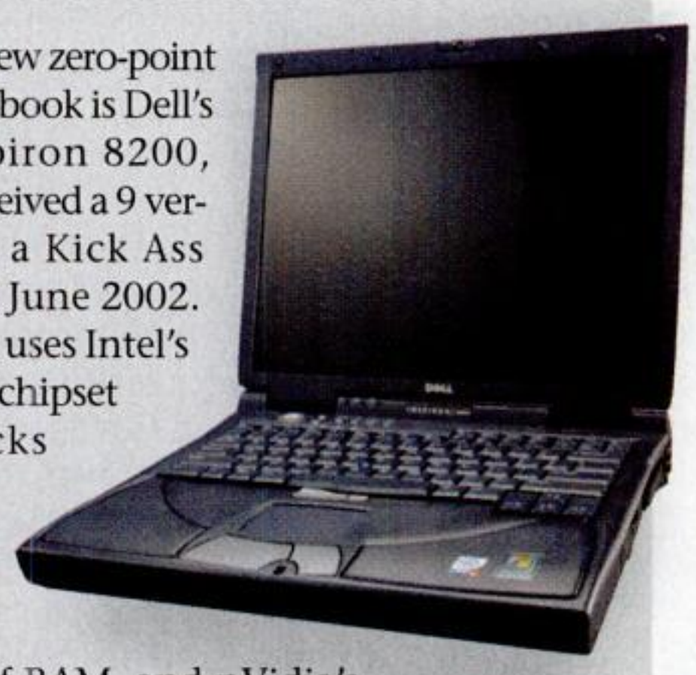
SYSmark2002 and *Premiere 6.01* are the best overall gauges of a system's performance. In each category, the longer the black bar, the better the system performed.

If a review system score ever falls below a zero-point system score, we note the negative percentage differential in a stigmatizing red.

The bar graph indicated how much faster the review system performed in respect to the zero-point system. If a system exceeds the 100% mark, the graph will show a full-width bar, a plus sign, and the actual score achieved.

These are the names of the six benchmark tests we run on each system.

The Notebook Zero-Point



The new zero-point notebook is Dell's Inspiron 8200, which received a 9 verdict and a Kick Ass Award in June 2002. The 8200 uses Intel's 845 DDR chipset and packs the power-efficient P4-M, 256MB of RAM, and nVidia's 128-bit GeForce4 Go with 64MB of video RAM. A full charge buys you just shy of four hours worth of DVD playback, and once you get tired of watching *Titanic* over and over, you can squeeze 174fps out of *Quake III*. Go to the benchmarking section of MaximumPC.com for details on our notebook-specific benchmark charts.

Best of the Best

As of June, 2002

Here are our current top picks for each hardware category. Red text indicates first month on chart. Check back next month for updates.

High-end videocard:
Visiontek Xtasy Ti 4600 (GeForce4 Ti 4600)

Budget videocard:
Leadtek WinFast Titanium 500TD (GeForce3 Ti 500)

Do-everything videocard:
All-in-Wonder Radeon 8500DV

Soundcard:
Sound Blaster Audigy Platinum

Hard drive:
Western Digital 1200JB

CD-RW drive:
Lite-on 32123S

Monitor:
Sony F520

P4 motherboard:
Asus P4T-E

Athlon XP motherboard:
Asus A7V333

Consumer DV camera:
Sony DCR-TRV17

Portable HD-based MP3 player:
Creative Labs Nomad 3

Photo printer:
Epson Stylus Photo 1280

Palm PDA:
Sony Clie PEG-N760C

Pocket PC PDA:
Compaq iPAQ 3835

5.1 speakers:
Klipsch Promedia 5.1

4.1 speakers:
Logitech Z-560

2.1 Speakers:
Klipsch Promedia 2.1

Our current gaming favorites: *Dungeon Siege, Jedi Knight II: Jedi Outcast, Tony Hawk Pro Skater 3*

Copyrighted material

Alienware Area 51

2.53GHz Alienware probes our benchmarks

Prepare to be abducted by the Area 51's blistering performance and mesmerizing screen.

We found ourselves standing in a deserted field. In a daze, we watched three blinking lights soaring away into the night sky. What the hell just happened?

Over the next week, the images returned to us in a sequence of flashbacks: 2.53GHz Pentium 4. *Flash*. 533MHz system bus. *Flash*. 512MB of PC1066 RDRAM. *Flash*. A 23-inch flat-panel display, and an alien face with cold, dead eyes.

After hours of hypnotherapy, we realized the truth: Alienware had abducted us. Its mission: to destroy our new benchmark suite. Unfortunately for mankind, Alienware has all but succeeded, as the Area 51 is simply the fastest PC we've ever tested.

Can this be any surprise, though? Intel's new 2.53GHz Pentium 4 powers the beast. And unlike older Pentium 4 rigs, the latest Area 51 uses the new 533MHz system bus that we previewed last month. To keep the system bus pulsing, Alienware clipped four sticks of PC1066 RDRAM into an Intel D850EMV2 motherboard using the new 850E chipset.

Besides the fact that PC1066 is more rare than emerald dilithium crystals, we were wondering just what the heck the fastest of RDRAM types was doing in an Intel motherboard. Didn't Intel say it wasn't going to support PC1066, which ups bandwidth from 3.2GB/sec (the speed of PC800) to 4.2GB/sec? We checked with our men in black at Intel, and were told the board doesn't support the higher speeds—officially. That's about as close as you can get to a nudge, nudge, wink, wink from Intel's MIB department.

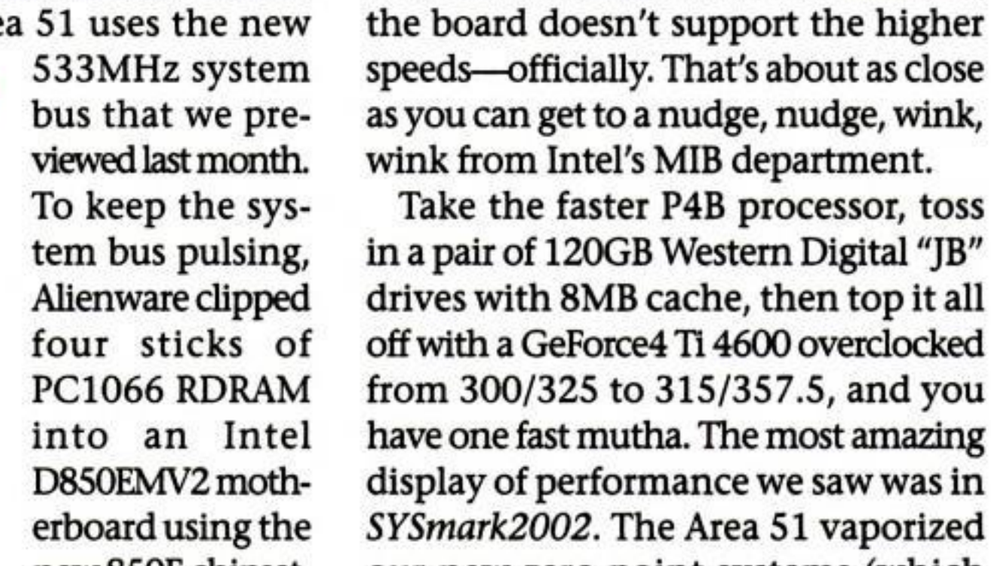
Take the faster P4B processor, toss in a pair of 120GB Western Digital "JB" drives with 8MB cache, then top it all off with a GeForce4 Ti 4600 overclocked from 300/325 to 315/357.5, and you have one fast mutha. The most amazing display of performance we saw was in *SYSmark2002*. The Area 51 vaporized our new zero-point systems (which are described in detail on page 56) and raised the *SYSmark2002* performance bar to 256. There was concern about the speed of P4-based systems in office apps when the CPU was idling at 1.5GHz. But 1GHz later, the P4 is the speed champ in both office productivity and content creation apps. Thanks to the OC'd GeForce4, we also saw blistering performance in our new *Jedi Outcast* benchmark, as well as in the *3DMark 2001* SE programmable-shader benchmark. We don't publish overall *3DMark* scores in system reviews, but we ran it on the Area 51 and saw a score in excess of 12,000. (Compare this to the overall score of 10,116 achieved by our zero-point systems.)

There were only two categories in which the Area 51 didn't dominate: audio extraction and movie rendering. The unspectacular performance in our audio extraction test was understandable—only systems with the fastest CD-R drives excel in this test, and Alienware opted for a Pioneer A04 DVD-R/RW burner, which compromises performance as a combo drive. The second performance shortfall was more mysterious. Our old *Premiere* benchmark used *Windows Media Encoder* to create video for Internet distribution, while our new *Premiere 6.01* benchmark creates video for DVD, using the Ligos *LSX-MPEG* 1.5 encoder. Even though the *LSX-MPEG* encoder takes advantage of SSE2 (Intel's latest instruction set), the Area 51 actually slipped behind the Athlon XP–based Game PC reviewed on page 66.

We suspect that *Premiere* itself is to blame, and that not even an SSE-charged encoder was able to propel the fastest P4 to Lab-wide domination. The P4 just plain lags when running some apps that haven't been optimized for its core. We've seen it before, and we're seeing it again. *Premiere* transitions that scream on Athlon systems are painfully slow on P4 systems. We suspect that this pattern won't change until Adobe

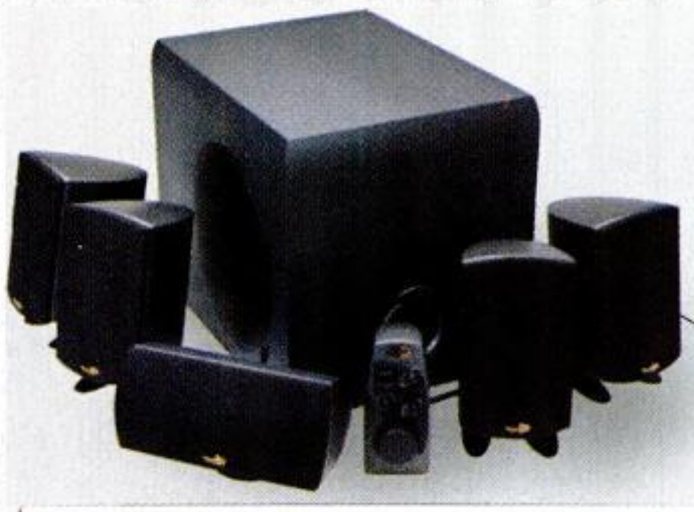
UNDER THE HOOD

THE BRAINS	
CPU	2.53GHz Intel Pentium 4
MOBO	Intel D850EMV2
RAM	512MB PC1066 (four RIMMs)
I/O ports	Two serial, one parallel, two USB 2.0, two FireWire, three analog audio out, two analog input, one headphone, one microphone, two optical SPDIF, two coax SPDIF
DISPLAY	
Videocard	GeForce4 Ti 4600 (315MHz /357.5MHz)
Display	Apple Cinema Display HD, 1900x1200, 23-inch viewable
STORAGE	
Hard drives	Two 120GB WD1200JB Western Digital with 8MB cache
DVD-ROM	Samsung SD-616F 16x DVD-ROM
DVD-RW	Pioneer A04 (2x DVD-RW/8x CD-R/24x CD-ROM)
NETWORKING	
LAN	Intel Pro/1000 T Server
SOUND	
Soundcard	Creative Labs Audigy Platinum eX
Speakers	Klipsch ProMedia 5.1
MOUSE	
Microsoft Optical 2.0A	
KEYBOARD	
Microsoft Office Keyboard	
BUNDLE	
Windows XP Professional, *PowerDVD, Unibrain FireNet*	
BOOT: 58 sec.	DOWN: 12 sec.



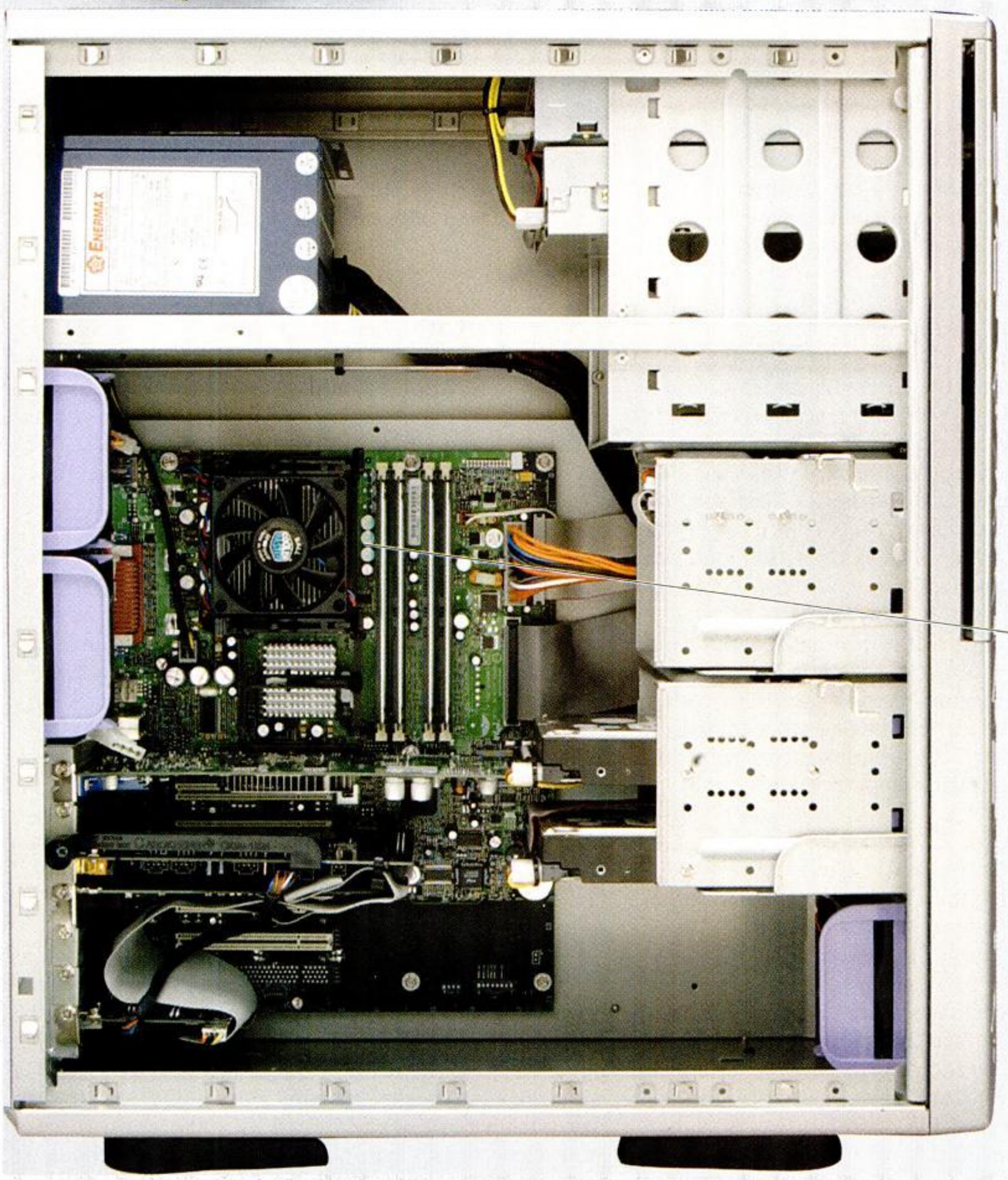
See page 56 for full benchmarking details.

Copyrighted material



Noisemakers: A set of Klipsch 5.1 ProMedia speakers lets you play the "X-Files" theme at very loud volumes.

Make pixels, not war: A Dr. Bott DVIator lets the Cinema HD Display talk to the GeForce4 card, and provides two USB 1.1 ports.



The road to 10GHz: With the 2.53GHz Pentium 4, we're one quarter of the way to 10GHz.

Marked man: The rumor is that when the aliens are done with you, they brand your buttocks with an image similar to this grill.

updates the *Premiere* code.

Benchmarks aside, the most stunning component in the Area 51 package is Alienware's new 23-inch flat-panel option. Most will recognize the monitor as an improved version of Apple's 22-inch Cinema Display that received a Perfect 10 verdict in our December 2000 issue. The native resolution now hits 1920x1200, brightness and contrast are better than ever, and pixel response was superb during gaming. As a testament to the power of the Area 51, we were able to play *Jedi Outcast* at 1600x1200 with anti-aliasing and Anisotropic filtering enabled—and we *still* got buttery smooth frame rates. So don't you worry about having to drop down to "playable" resolutions and face the negative effects of LCD pixel interpolation.

Bottom line: The Area 51 was so unstoppable, we had to shout "Klaatu barada nikto" to shut it down.

—GORDON MAH UNG

MAXIMUMPC VERDICT

Area 51
ALIENWARE

+ COLONIAL VIPER

Fastest gaming rig we've ever seen. And let's not even talk about that monitor!

– CYLON RAIDER

DVD-ROM drive hobbled during audio extraction; we would have preferred a high-speed CD-RW instead of the DVD-ROM. And some apps—like *Premiere*—still bog on the P4.

www.alienware.com
$8000 ($5000 w/o monitor)

9

Sony VAIO PCV-MXS20

Plenty of polish, but not enough power

Once again, Sony ships a "convergence" PC that lacks CPU and video power.

If you're the type of person who just can't get enough digital entertainment in his life, then you're a prime candidate for the VAIO MX line, Sony's latest bid to redefine the desktop PC. The MXS20 features all the basic features of a standard box, along with an impressive laundry list of entertainment center accouterments. Sounds great on paper, but we think Sony made too many compromises on the PC side of the equation.

Aesthetically, the new VAIO is a hit. Its beautiful lucite-esque enclosure might best be described as a marriage between classic Sony panache and neo-Apple styling. And we can't deny the allure of the VAIO's hardware victories. There's a Pioneer A04 DVD-RW drive, which is the best DVD burning solution currently available and a must for any video editing system. We also love the integrated NetMD MiniDisc recorder, an extension of MiniDisc that allows MP3 and WMA compression playback, as well as 32x recording. Putting one of these drives in a PC is such a good idea, we have to wonder why Sony didn't do it years ago.

Also of note is an IR remote and a multifunction LCD that displays streaming digital media information (such as MP3 song names). Additionally, the MXS20 features a pair of toslink optical in/out ports, an integrated FM tuner, an MPEG2 decoder, a TV tuner and a 2x20-watt amp to drive the external speakers. And who won't love the little trap door on the front bezel that hides slots for PC cards and Sony Memory Sticks?

Now for the bad news, starting with the videocard. Anyone who puts a GeForce2 MX in a near-$3,000 PC deserves to be ritualistically slapped by circus clowns while his children are forced to watch. Come on, Sony, would it have been so difficult to include a GeForce4 MX or, better yet, a Ti 4200? Another thing that irritated us was the CPU. While 2GHz of P4 power is nothing to sneeze at, Sony decided to go with the crusty old "Willamette" core instead of the shiny new "Northwood" core—and 256K less cache does not a performance PC make. To add insult to injury, Sony threw in a 5400rpm Maxtor hard drive instead of the standard 7200rpm drive. All these crummy choices hurt performance in what should have been two of the rig's key strengths: gaming and consumer-level video editing. Oh well, at least music playback doesn't require any power.

Our *Premiere 6* benchmark saw right through Sony's Willamette shenanigans, and crushed the little proc like nobody's business—the MXS20 trailed behind the 2.5GHz Alienware system (pg. 60) by a whopping 223 seconds. Game benchmarks were even worse, so don't even think about purchasing this machine for 3D frame rates and shader effects unless you fancy spending even more for an add-on graphics card. And in *SYSmark2002*, the MXS20 was a full 40 points behind our test-bed system, which uses a P4 of the same clock-speed.

The bad news doesn't end with what's under the hood. The Sony-branded speakers seriously lack bass, and we have to wonder why a multimedia-oriented rig like the MXS20 doesn't ship with a proper 5.1 setup. The remote is a cool addition, but its quirky behavior and slow response times bugged us, and we have to wonder why we received a 15-inch flat-panel when 17- and 18-inchers are now standard.

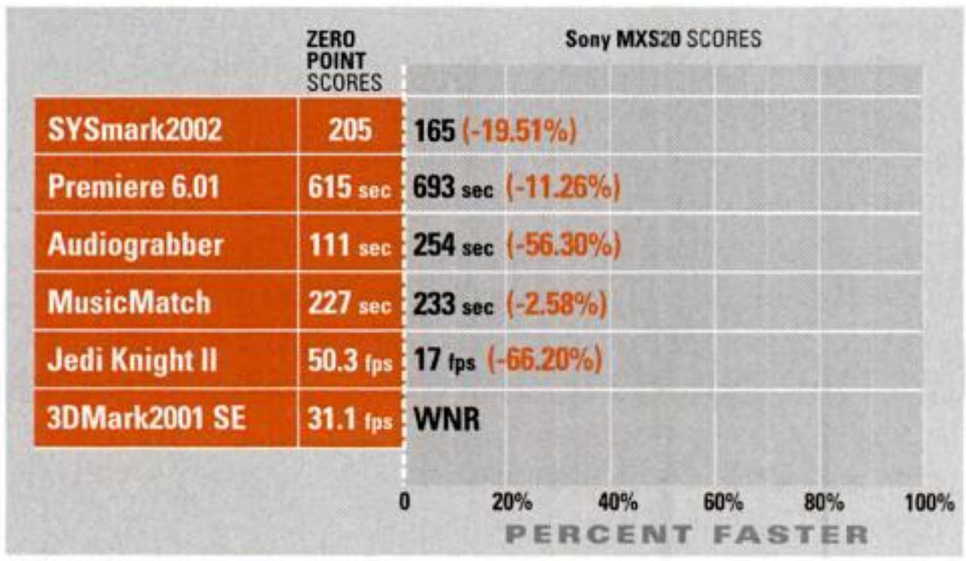
The software bundle is somewhat of a mixed bag itself. Sony included quite a few powerful apps—such as *Premiere 6 LE* and *DVDit! LE* for video editing and DVD authoring, respectively—but the music and video playback applications leave a lot to be desired. Sony's *SonicStage* software, which manages digital music collections, is extremely cumbersome and easily bested by even the most rudimentary competing apps.

The Sony PCV-MXS20 is a disappointment—not only for what it is, but for what it could have been. For years now, we've reviewed Sony's "convergence" PCs, and each one has been dinged for having the right idea, but underpowered components. It's not our business to tell Sony what price tag the general consumer public is willing to pay, but *we'd* gladly pay an extra $1,000 for a VAIO rig loaded with premium components. State-of-the-art power would make a winning complement to all the features that Sony has already mastered.

—JOHN TUMMINARO

UNDER THE HOOD

THE BRAINS	
CPU	2.0GHz Intel Pentium 4 Willamette
Motherboard	Asus i845D
RAM	512MB DDR (one stick)
I/O ports	Two USB 1.1, one front headphone jack, two FireWire, one parallel, one serial, one RCA in/out, toslink in/out, one mic-in, one FM antenna port, two speaker terminals
DISPLAY	
Videocard	GeForce2 MX 32MB
Monitor	Sony 15-inch flat panel w/ DVI input
STORAGE	
Hard drive	120GB Maxtor D540X
Optical	Pioneer DVD-RW A04
Write:	2x DVD-R, 1x DVD-RW, 8x CD-R, 4x CD-RW
Read:	6x DVD-ROM, 2x DVD-R/W, 24x CD-ROM, 24x CD-R/W
MiniDisc drive	MDLP, Net MD protocol support
NETWORKING	
LAN	CNET Pro200WL
Modem	V.90 compatible data/fax modem
SOUND	
Soundcard	Sony Digital Audio System
Speakers	Sony stereo speakers
MOUSE/ KEYBOARD	
Sony PS/2, Sony PS/2	
BUNDLE	
Microsoft Windows XP Home, *Word Perfect 10, DVDit! 2.5 LE*, Adobe *Premiere 6 LE*, Sony *SonicStage Premium, Movie Shaker*	
BOOT: 44 sec.	**DOWN: 16 sec.**



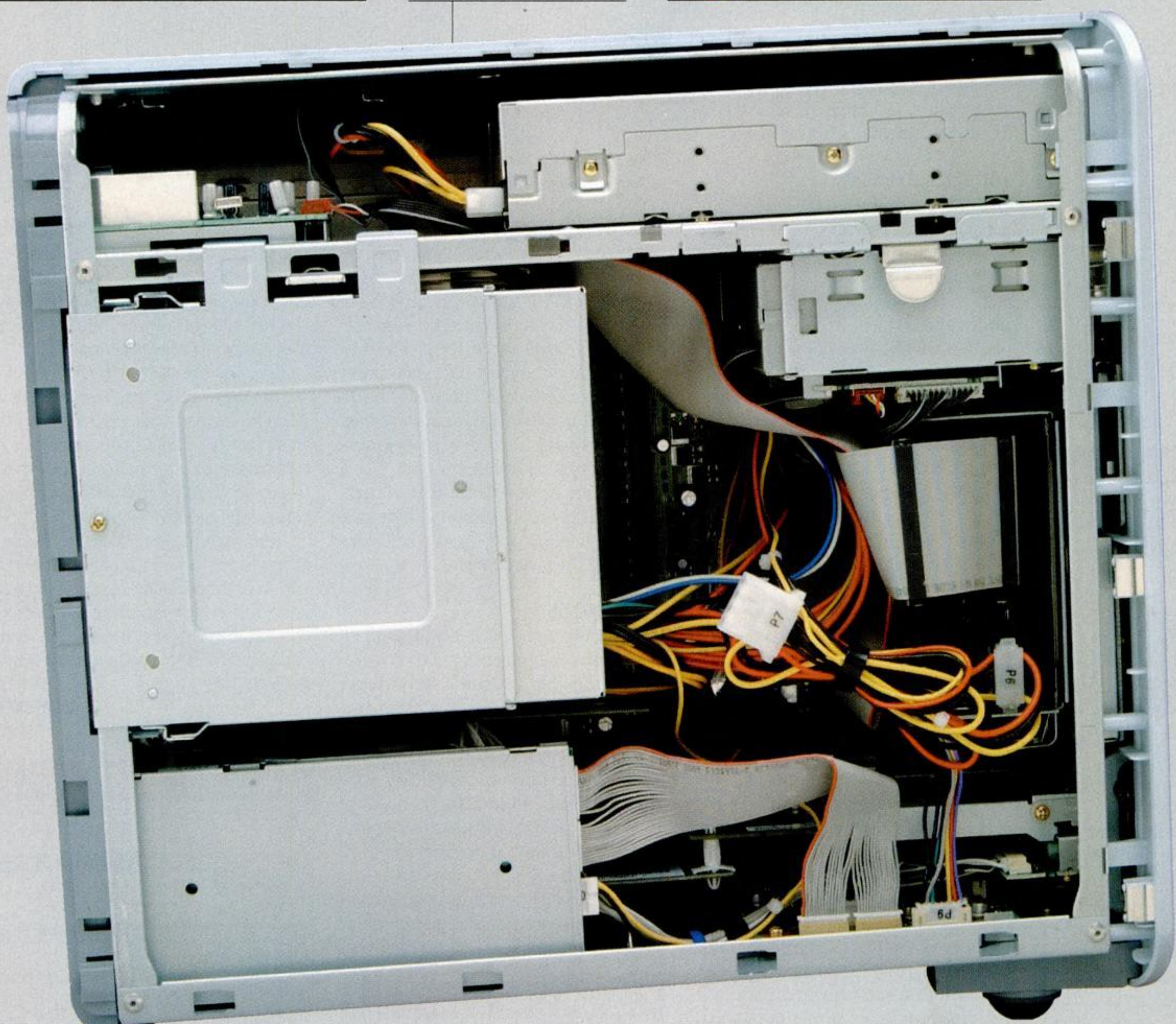
Full benchmarking details can be found on page 56.

Copyrighted material

Perfect match: This is the first time we've ever seen a MiniDisc mated with a PC, and we like it.

See for yourself: The LCD is big, bright, and a sight to behold.

What's your angle: No, this isn't an optical illusion. The VAIO really is propped up on the front end.



MAXIMUMPC VERDICT

VAIO PCV-MXS20
SONY

THE RAMONES

Neato styling, tons of thoughtful extras. And it has a remote!

THE BEE GEES

Overpriced and severely underpowered. But, hey, it has a remote!

www.sony.com
$2,800 ($3,400 w/15" LCD)

6

Hide and seek: A false panel in the front slides away to reveal a handy set of connections for headphones, Memory Stick, USB, and more.

Wow, a remote!: Too bad we almost threw it at the wall in frustration over its sluggishness.

Copyrighted Material

40x Burning—Discs of Fury!

Teac and TDK go head to head

Two more companies with great track records in optical drives—TDK and Teac—are throwing their hats into the 40x ring. But at this lofty performance ceiling, is it really possible to differentiate one drive from another?

The VeloCD's signature translucent blue tray adds a hot-rod look to the hot-rod performance.

THE BUNDLE

Ahead *Nero*, TDK *Mixmaster*, Ahead *InCD*

TDK VELOCD 40/12/48

OK, we said we weren't going to give a Perfect 10 rating to any drive that couldn't burn edge-to-edge at a minimum of 24x. But that was before the VeloCD parked itself in the Lab and not only met, but blew away, our expectations. So we're not going to dick around—we're giving the latest VeloCD that elusive reward, and here's why.

THE BUNDLE

Roxio *Easy CD Creator 5*, *MusicMatch Jukebox 7 Basic*, ArcSoft *PhotoImpression*

Teac: Minimalist chic or just bleak?

Although the VeloCD beat both the 40x Plextor and Teac drives by just a scant few seconds in our 647MB burn test, that was the *least* of its accomplishments. What absolutely floored us were the 48x peak read speeds (with an average of 36x across the entire span of the disc) and 48x digital audio extraction (DAE). The drive ripped an entire 75-plus-minute CD in 2:09—exactly 20 seconds faster than the latest Plextor CD-RW drive, the closest competitor. And the audio extraction was flawless. Just to be sure, we listened to the whole CD, instead of just the first and last tracks, which are always the most susceptible to hiccups.

One of most amazing things about the VeloCD, however, is that a newbie fresh out of an AOL chat room would be just as happy with this drive as the most hardcore power user. TDK supplies the very, very best documentation we've ever seen for *any* peripheral, leaving no guesswork to the user, explaining Burn Proof implementation and DMA enablement in simple and effective terms. Meanwhile, the power user gets access to C2 error-correction information for better DAE from damaged discs. Providing C2 info to applications has become mandatory for a Kick-Ass Award.

Let's see—the fastest burner, incredible read speeds, the rippingest digital audio extraction, and the best software in town. The award, please...

TEAC 40/12/48

You know what sucks? Being good at what you do, but getting your chance to perform after a superior technology has finished its audition. And that's the story of the Teac 40x.

Like we've stated many times before, now that CD burners have hit a burn-speed ceiling, manufacturers need to make their drives stand out in other categories. One way to do this is by not bundling the Basic version of Roxio's *Easy CD Creator 5*. Not only does *Easy CD Creator* impose its usual performance penalty (3:47 to burn our 647MB test disc as opposed to 3:33 to write the same disc using *Nero*), but it also withholds its full suite of features. All the grayed-out menu options show you exactly what you're missing from the Deluxe version that Teac didn't pony up for.

Teac also bundled a 10x CD-RW disc, despite the fact that the drive rewrites at 12x. Out of the goodness of our hearts, we replaced it with a 12x disc from Plextor to test rewrite performance at the drive's top speed. Even then, at 7:02, it came in behind the VeloCD's 6:51.

Although the Teac posted the fastest access times we've ever recorded in the Lab (a mere 66ms for random access) and supports the reporting of C2 error-correction codes, it still seems ho-hum compared to the overall performance of the VeloCD.

—LOGAN DECKER

BENCHMARKS	TDK	TEAC
Average data transfer (MB/sec)	5.4	5.4
Average drive rating	36.59x	36.98x
Random/full-stroke seek (ms)	91/93	66/74
Audio extraction (min:sec)	2:09	2:35
Data CD burn (min:sec)	3:28	3:47
CPU utilization (at 8x)	9%	50% (8x)

The audio extraction test uses a commercially stamped 75:27 minute audio CD. The data-CD burn test uses the bundled applications to create a 647MB CD-R. For more information on how we benchmark optical drives, look at the Benchmarks section of MaximumPC.com.

WHERE'S THE @#%! MEDIA?

Inside the VeloCD 40x package, you'll get two 32x CD-R's and one 10x CD-RW. What's going on here? Well, both types of media are rated for burning at the VeloCD's top speeds—40x and 12x, respectively (and our tests agree). But because TDK sells media for other optical drives, they're loathe to re-label the package and guarantee performance on other drives that aren't calibrated for this media.

This underscores the Catch-22 going on in the CD media industry at the moment. No one wants to mass produce 40x media until there are enough 40x drives on the market, yet few are willing to buy a 40x drive without enough media available. In fact, there's not even an agreed upon specification for 12x CD-RW media yet!

For the least amount of grief, we recommend you order your high-speed drive from a company that sells high-speed media as well, such as Plextor or TDK.

MAXIMUMPC VERDICT

VeloCD 40/12/48
TDK

+ BABAR AND CELESTE
The fastest drive we've ever tested in a fancy package with no compromises.

– JIM AND TAMMY FAYE
Well, they could give it away for free.

www.velocd.tdk.com
$150
10

MAXIMUMPC VERDICT

40/12/48
TEAC

+ BORIS AND NATASHA
Even if you don't pair the Teac with *Nero*, you're still getting some of the best speeds available in a CD burner today.

– FERDINAND AND IMELDA
Why settle for second-rate software in what's supposed to be a cutting-edge drive?

www.shopteac.com
$150
8

Copyrighted material

Winbook J4

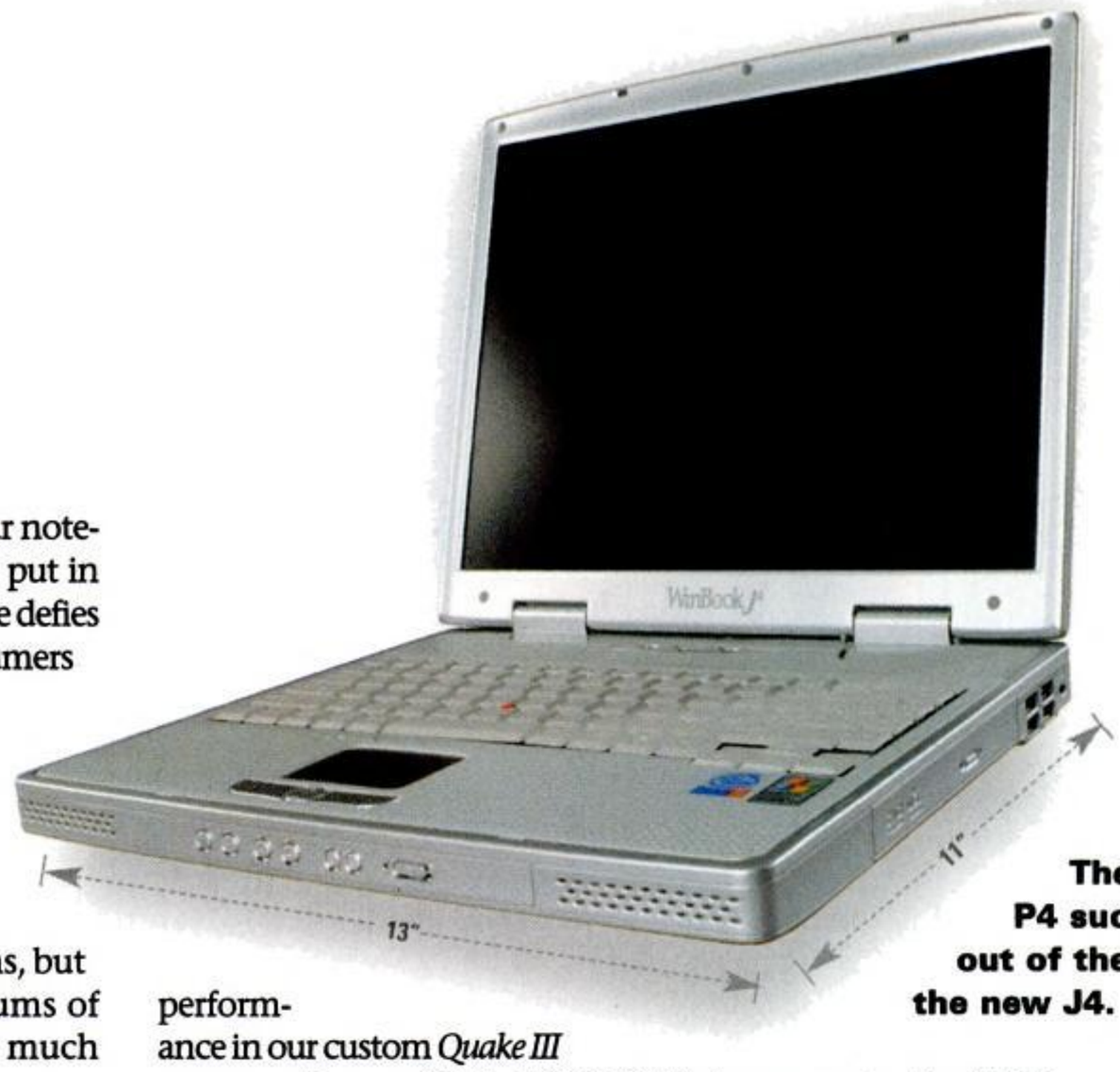
Breakin' the (Intel) Law

If Intel's fastest mobile CPU isn't fast enough for your notebook PC, what do you do? If you're Winbook, you put in one of Intel's fastest *desktop* CPUs instead. The practice defies official Intel policy, but can theoretically provide consumers with incredible power at a reasonable price, albeit at the expense of battery life.

Winbook's new J4 notebook sports a 2.4GHz Pentium 4, the clock speed of which is a full 600MHz faster than the speed of the 1.8GHz Pentium 4M, Intel's current fastest mobile proc. A 2.4GHz P4M probably won't ship for many months, but if it *were* available today, it would cost ungodly sums of money. (Intel's mobile CPUs always wholesale for much more than the desktop versions.)

Using Intel's 845 chipset, the J4 sports 256MB of DDR266 RAM, an ATI Mobility Radeon 7500, and a 30GB hard drive. With this hardware and a 700MHz advantage over our new Dell zero-point notebook (see this month's In the Lab), we expected the J4 to have a decisive victory in all benchmarks, but that just wasn't the case. The Winbook's most impressive performance came in our new *Premiere 6.01* test. The Winbook demolished our zero-point notebook, with a performance that was 23 percent faster.

We thought we would see similar results in *SYSmark2002*, but the Winbook trumped the Dell by just 7 percent. Even more disappointing, the J4 got blasted in our *Quake III Arena* test. Our zero-point notebook hits 63fps in *Quake III*, but the J4 could muster just an unplayable 25fps. To determine whether a random driver issue was leading to poor performance in our custom *Quake III* map, we also ran *3DMark2001 SE*. But once again, the J4 fell short, scoring just 3,867 to the zero-point Dell's 4,920. Clearly, something is amiss. Logic would dictate that the Radeon is to blame, but we've personally seen better performance from the 3D chipset during our own Lab testing, and analysts report that the ATI chipset and GeForce4 Go are essentially equal.



The desktop P4 sucks the life out of the battery in the new J4.

Performance aside, we were also concerned with the J4's battery life. Desktop CPUs consume much more power than their mobile counterparts, so there's always a risk that a notebook will run out of juice practically before your hourglass empties. To address the problem, Winbook includes a massive 12-cell Lithium Ion battery that could double as a police baton. The gesture is appreciated, but the J4 still didn't do well in our DVD movie run-down test. We successfully watched about 86 minutes of our movie before the machine conked out. This is far short of our zero-point's endurance.

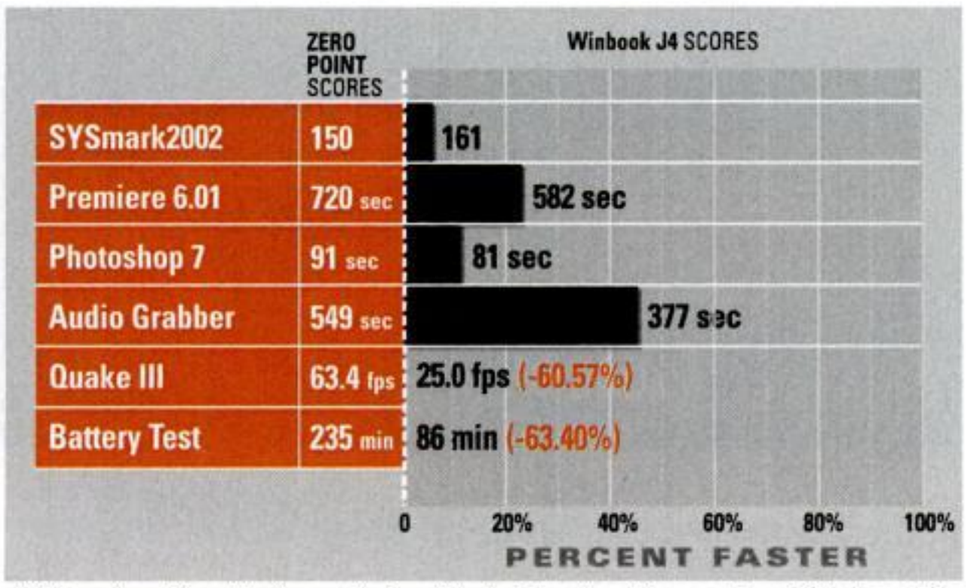
The J4 comes stock with a Toshiba combo drive that reads DVDs at 8x and CDs at 24x, and burns CDs at 8x. In our audio extraction test, the J4's Toshiba smoked the Sony drive in our zero-point notebook. Standard on the J4 are an onboard 802.11b wireless connection, a Realtek Fast Ethernet card, and four USB ports.

We initially thought Intel was being a drama queen when it got fussy over the use of desktop CPUs in notebooks, but now it looks like there's something to the warning. There's no denying that in specific CPU-intensive applications—such as *Premiere*—the J4 has an advantage. But when it comes to battery life, gaming, and all-around application performance, the J4 is hobbled.

—GORDON MAH UNG

UNDER THE HOOD

THE BRAINS	
CPU	2.4GHz Pentium 4 (512K full-speed L2 cache)
RAM	256MB DDR266
I/O ports	One Cardbus PC Card slot, one VGA, one S-video, one parallel, four USB 1.1 ports, mic-in, line-in, headphone, IrDA, FireWire, Fast Ethernet
NETWORKING	
Modem	HSP56 World MicroModem
LAN	Realtek RTL 8139 Fast Ethernet InterSil v2.5 802.11b
DISPLAY	
Videocard	ATI Mobility Radeon 7500 (64MB DDR)
Display	15-inch, 1400x1050
STORAGE	
Hard drive	IBM Travelstar 30GB 4200rpm
CD-RW/ DVD-ROM	Toshiba SD-R2102
SOUND	
Audio chip	Realtek ALC201 AC97 Audio
TIPPING THE SCALES	
Lap weight	8.4 lbs
Carry weight	9.25 lbs
BUNDLE	
Microsoft Windows XP Professional, Intervideo *WinDVD*	
BOOT: 58 sec.	**DOWN: 30 sec.**



Full benchmarking details can be found in the Benchmarking section of MaximumPC.com

MAXIMUMPC VERDICT

J4
WINBOOK

+ WIN SOME

The desktop 2.4GHz P4 is awfully fast in some tests.

– LOSE SOME

Average battery life. Disappointing lack of speed. Is using a desktop CPU in a notebook such a good idea after all?

www.winbook.com
$3,300

7

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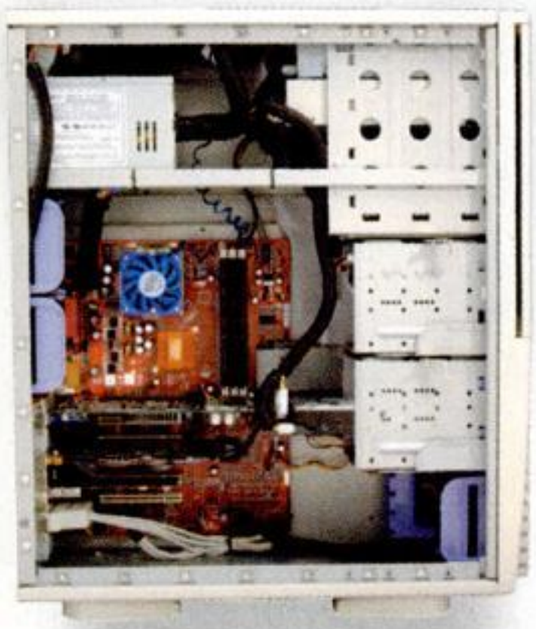
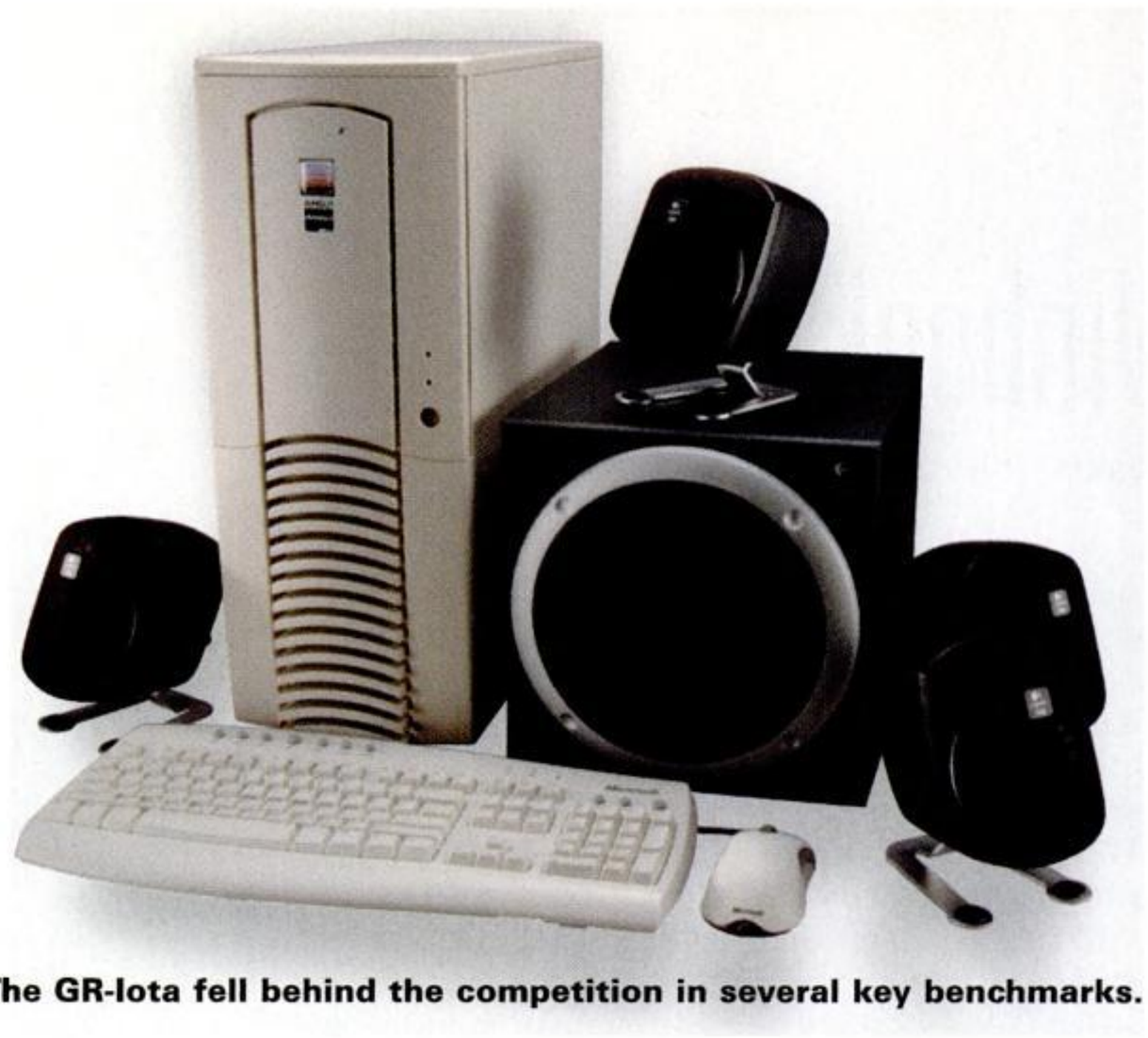
GameRigs GR-Iota

Is AMD's party over?



There's no denying the GR-Iota's clean layout and quality components.



The GR-Iota fell behind the competition in several key benchmarks.

We have to give GameRigs some props. Showing up to a fight against Intel's new 2.5GHz Pentium 4 is like, well, showing up to a gunfight with a knife. The knife in this case would be AMD's 1.73GHz Athlon XP. For the better part of a year, the Athlon was able to give the P4 a drubbing in many benchmarks, but Intel's new 2.5GHz CPU and 533MHz bus are monster performers that make Athlon-based boxes such as the GR-Iota look like Johnny-come-latelies. Just check out the Alienware review on page 60 for evidence.

But first the good news: The GR-Iota is loaded with a good supporting cast of power components, uses a case nearly identical to the Alienware's Antec (sans the silver paint job), and triumphed in two areas where the Alienware was lacking.

The most obvious performance difference came in our new MPEG2 encoding test, in which we use Adobe *Premiere 6.01* and the Ligos *LSX-MPEG* plug-in to edit and render an MPEG2 file. The Ligos encoder uses a heavy dose of P4-friendly SSE2 code, so how was the GR-Iota able to shoot down the Area 51? Well, before the encoder outputs the movie to MPEG, *Premiere* adds a few titles, transitions, and special effects—and we strongly suspect that *Premiere* isn't yet optimized for the P4. This doesn't mean the Intel CPU is bad for video editing and that Athlon is dominant; your results may differ when using different software and encoders. But we can divine that the Athlon XP is king when it comes to *Premiere*.

The GR-Iota also beat the Area 51 in our audio extraction test. Using *Audio Grabber 1.81*, we rip an entire album to WAV format. The Plextor's mighty rip-speed simply blew away the Pioneer A04 DVD-RW drive in the Area 51. Unfortunately, the GR-Iota fell far short in gaming benchmarks. In our new *Jedi Outcast* benchmark, the Area 51 outpaced the GR-Iota by no fewer than 13fps. The GR-Iota also produced five fewer frames than the Area 51 in our *3DMark 2001 SE* benchmark, which tests a videocard's ability to render programmable shader code. Some of the performance deficit can be ascribed to the fact that GameRigs ships non-overclocked videocards. But some of the deficit can also be chalked up to pure CPU power (or the lack thereof). So if you're Mr. Hardcore Gamer, consider looking to Alienware or to one of GameRigs' P4 boxes.

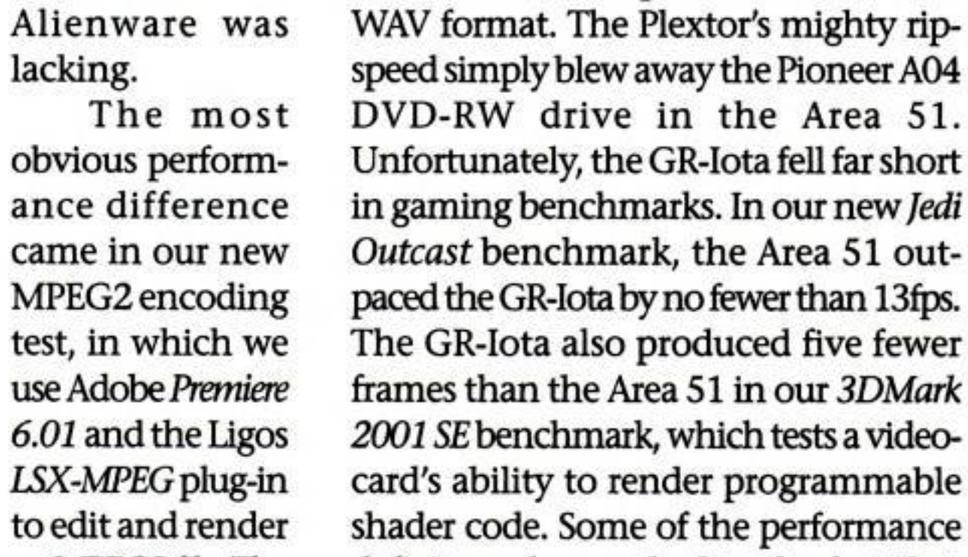
The widest performance gap appeared in *SYSmark2002*. Designed to measure how fast a machine can crank through a suite of content creation and productivity apps, *SYSmark2002* stresses all of a PC's subsystems. The GR-Iota produced a sad score of 177. Not only does this score look plain silly next to the Alienware's 256, it also comes in lower than the scores we recorded during Athlon mobo testing last month—and those Athlon boards were all using slower CPUs (1.67GHz) and hard drives!

Athlon foibles notwithstanding, this rig does come with a whopping 1.5GB of DDR333 memory, a 100GB Western Digital drive with an 8MB cache, a Visiontek GeForce4 Ti 4600, and Logitech's fantastic Z-560 4.1 speakers. Nice power parts, the lot of them. But overall, the GR-Iota could probably benefit from a little system tweaking to eek out more performance. And it also warrants a lower price tag. Compared with Alienware's Area 51, the GR-Iota will save you a cool $1,500. But at $3,027, this GameRigs machine is still more expensive than Athlon systems from Polywell and Totally Awesome that we've reviewed recently.

—GORDON MAH UNG

UNDER THE HOOD

THE BRAINS	
CPU	AMD 1.73GHz Athlon XP 2100+
Motherboard	MSI KT3 Ultra
RAM	1.5GB DDR333 (three DIMMS)
I/O ports	Two PS/2, four USB, two serial, one parallel, three analog audio out, one mic, one input, one FireWire, gameport, Ethernet
DISPLAY	
Videocard	Visiontek GeForce4 Ti 4600
Display	not reviewed
STORAGE	
Hard drive	100GB WD1200JB Western Digital with 8MB cache
DVD-ROM	Lite-On 16x DVD-ROM
DVD-RW	Plextor 40/12/20
NETWORKING	
LAN	3Com 3C905B-TX 10/100 Ethernet
SOUND	
Soundcard	Creative Labs Audigy
Speakers	Logitech Z-560 4.1
MOUSE	
Microsoft Optical Intellimouse	
KEYBOARD	
Microsoft Internet Keyboard	
BUNDLE	
Windows XP Professional, *Easy CD Creator 5.1*, Cyberlink *PowerDVD*	
BOOT: 49 sec.	**DOWN: 12 sec.**



See page 56 for full benchmarking details.

MAXIMUMPC VERDICT

GR-Iota
GAMERIGS

+ MODEL 29 SMITH & WESSON

First-rate storage devices and a whopping 1.5GB of DDR333 are the highlights of the GR-Iota.

– DIME-STORE SWITCHBLADE COMB

Old-school Athlon XP CPU and configuration issues hold the GR-Iota back.

www.gamerigs.com
$3,027
7

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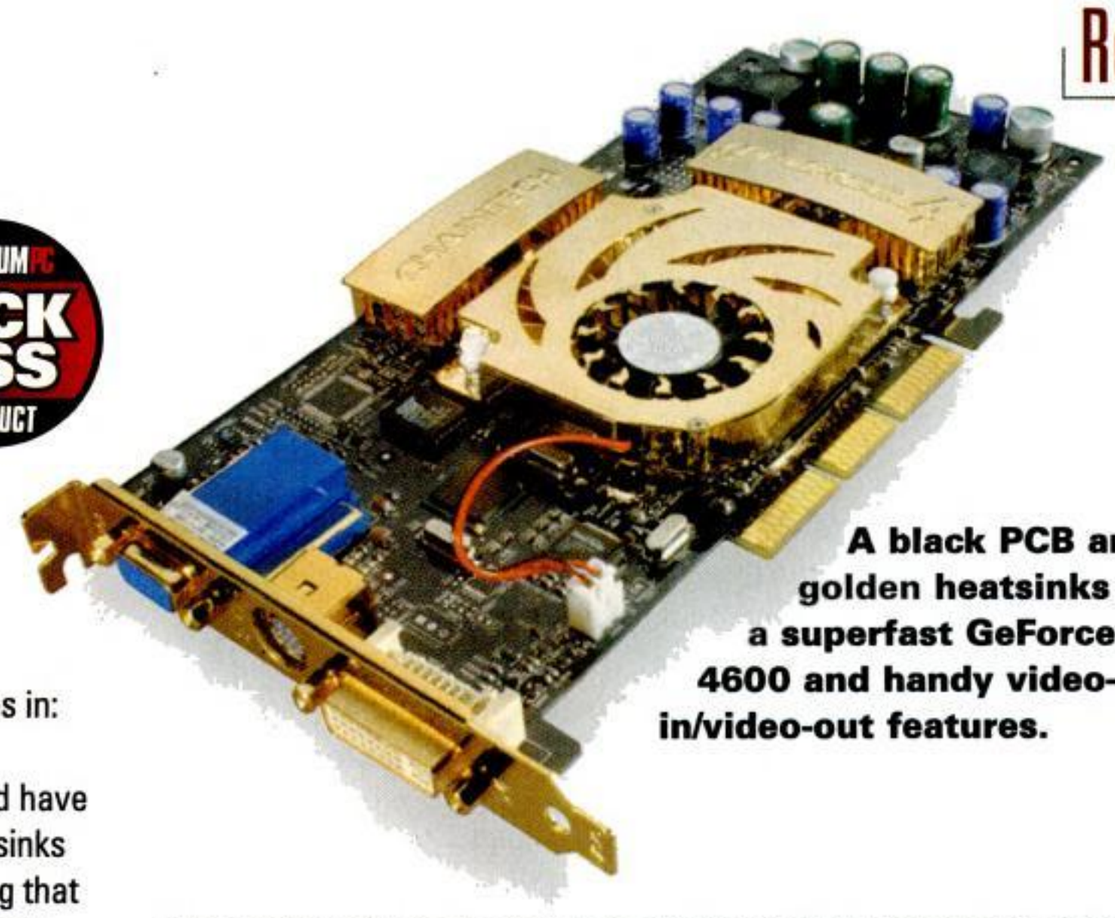
Chaintech A-GT61 Special Edition

You are now entering the GeForce4 zone

MAXIMUM PC KICK ASS PRODUCT



A black PCB and golden heatsinks conceal a superfast GeForce4 Ti 4600 and handy video-in/video-out features.

Submitted for your consideration, an otherworldly accelerator, unconstrained by the boundaries of time and space. This top-of-the-line Ti 4600–powered core will push your PC obsession into the whirling phantasm of insanity. Is the Chaintech A-GT61 Special Edition the fastest 3D accelerator we've seen? Can it blow through benchmarks in the blink of an eye? We'll answer these questions in: *The GeForce4 Zone.*

Unlike most GeForce4 boards, which use the standard nVidia fan and have no memory heatsinks, the Chaintech board includes unique golden heatsinks on both the processor and memory. Strange design decision, considering that the board's 300MHz core and 325MHz DDR SDRAM aren't overclocked at all. But with the help of the memory heatsinks we were able to overclock the board to 310MHz/340MHz without any problems. When we bumped the board past a 350MHz memory clock, visual artifacts appeared.

The Chaintech also includes a Philips TV encoder chip, which lets you output and capture S-video signals using an included dongle and software. This chip occupies the real estate set aside for nVidia's Personal Cinema chip. Putting some type of functionality into the open PCB spot is much appreciated, but we'd still prefer the Personal Cinema option.

For software you get *WinDVD*, *3Deep* (a monitor calibration utility), *TurboGfx* (an overclocking utility), *MDK2*, and *Aquanox*, which is one of the few games currently available that will use the Chaintech's programmable shaders. If you're looking for a board that's not just another plain-Jane GeForce4 Ti 4600, the Chaintech A-GT61 must be considered.

CHAINTECH A-GT61 SPECIAL EDITION BENCHMARKS

	3DMark 2001 SE: Game 2	3DMark 2001 SE: Game 4	3DMark 2001 Overall Default Run	Jedi Knight II: MPC Demo	Quake3 MPC Demo 1280x1024
No AA	87.1fps	31.7fps	10116fps	50.5	102.5
2x AA	62.4fps	22.4fps	8466fps	49.4	89.8

All benchmarks were run at 1280x1024 in 32-bit color at the highest quality setting, except for the *3DMark 2001* default run, which uses the default 3DMark settings with no AA and 2x AA. The wildebeest runs naked.

ROD SERLING: Swank gold heatsinks make for decent out-of-the-box OC'ing, and video-input/output and a pair of cool utilities are nice.

BOB SAGET: The only thing we would add is a genuine Personal Cinema chip, for TV viewing and timeshifting usage.

—WILL SMITH

MAXIMUM PC VERDICT: 10

$400, Chaintech, www.chaintech.com.tw

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Logitech Mouseman Traveler

Marvelous mini-mouse in a metal shell

If you have a 4-inch-tall computer and are looking for a tiny mouse to go with it, the Logitech Mouseman Traveler is the perfect companion. Shoot, even if you have a regular-size PC—or are sick of fumbling with the eraser doohickey or the touchpad on your notebook—you might still want to shell out the $50 for a Mouseman Traveler.

As you might have already guessed, small-statured mice have a few limitations. While they're definitely better than using your laptop's "integrated pointing mechanism," they're not large enough to guarantee comfort during a 14-hour *Quake III* session, or anything else that requires extended periods of mousing.

Still, despite its small size, Logitech managed to cram a lot of functionality into this little rodent. Its optical sensor updates 2,000 times a second, which gives the Mouseman Traveler a degree of accuracy we've not seen on any mouse, save the newest Intellimouse Explorer. The Traveler also includes a scroll wheel and the standard three buttons, like most full-grown mice. The two main buttons aren't made of the usual injection-molded plastic, but are instead two pieces of curved metal that can be easily depressed. Unlike other mini-mice buttons, which are simply too small, the Traveler's buttons are easy to use.

Also included in the package are a USB extension cable (which adds an extra two feet to the default three-foot cord), a deluxe hardsided leatherette carrying case, and a USB-to-PS/2 adapter.

We'd never advocate using the Traveler for an extended period of time on a desktop rig, but for road warriors, the Mouseman Traveler is a perfect complement to a new laptop equipped with the GeForce4 Go or Radeon 7500 Mobile chipset.

Featuring a stylish brushed-metal surface that doubles as the mouse's buttons, the Mouseman Traveler is sturdy enough to take almost anywhere.

MICE: Perfect size, great design, and handy traveling accessories make this a good mouse for road warriors everywhere.
RATS: At $50 the Mouseman Traveler is a little pricey.

—WILL SMITH

MAXIMUM PC VERDICT: 8

$50, www.logitech.com

Wireless E-D Glasses

Here's your 3D game, Four Eyes

We all spend mucho dinero on the latest and greatest 3D cards, yet none of us actually plays games in 3D. eDimensional is trying to change all that with its latest pair of 3D shutter glasses, the Wireless E-Ds.

The glasses use the basic properties of stereovision to work their voodoo magic: When you're playing a 3D game, eDimensional's bundled software automatically converts each frame into either a left or right perspective. The first frame appears slightly to the left, the second frame to the right, the third frame to the left, and so on. The glasses are then synced with this flicker show so that each lens opens at just the right moment. The result is a sense of depth perception that should be familiar to anyone who's seen an old 3D movie like *Bwana Devil* or *House of Wax*.

The scheme doesn't require any in-game support. In fact, eDimensional says more than 85 percent of all games will work with the glasses, and our own findings support this claim. Like the name suggests, the glasses are wireless, which greatly reduces the annoyance of having to wear a weird, alien device over your face during the heat of battle. Unfortunately, eDimensional has done little to make the chunky, utilitarian design truly comfortable—the glasses are as heavy and pinchy as all the other shutter specs we've ever worn.

After loading the standard nVidia stereoscopic driver, we wailed away. We couldn't get *Aquanox* to work in stereoscopic mode, but *Jedi Knight II, Return to Castle Wolfenstein,* and *Quake III* ran without a hitch. The effect was really cool for a while—3D objects appeared to leap from 3D space. But after about 15 minutes, some of our Lab monkeys experienced headaches. Some people can use 3D glasses at length without developing headaches or dizziness, but many gamers will experience some type of adverse reaction. This problem is inherent to *all* 3D glasses we've tested—we don't fault eDimensional's specific technology.

If you're looking for style, stick with Gucci

As stereoscopic glasses go, these are good ones—the first wireless specs we've ever tested, and this time only *some* of us suffered headaches. Just make sure you try before you buy, or you might find yourself spending your next paycheck on Advil instead of hardware.

NED FLANDERS: Wireless, as well as one of the best implementations of a troubling technology.
MR. BURNS: High nausea factor, and the design probably isn't optometrist-recommended.

—JOHN TUMMINARO

MAXIMUM PC VERDICT: 6

$100, www.eDimensional.com

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John Dvorak

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TURBO-COOL 425 ATX (PFC option)
TURBO-COOL 475 ATX-PFC
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Dell™ 8200 (2GHz)	2087	119

[1] PC WorldBench 4 score running Windows 2000 (higher no. is better).

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SLEEKLINE 1000 (1GHz Pentium III)
SLEEKLINE 2400 (2.4GHz Pentium 4)

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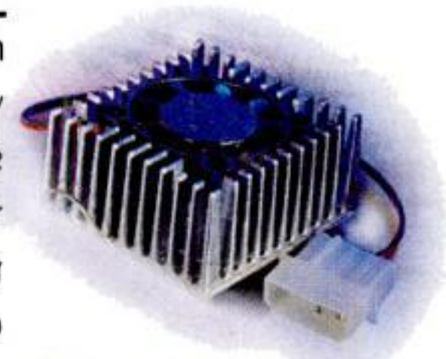

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CPU-COOL 1U (Pentium III, FC-PGA,1U)
CPU-COOL 478 (Pentium 4, Skt 478)
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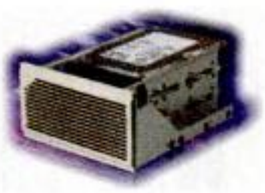

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Palm M130

La-dee-da, another low-priced Palm

The Palm M130 gives cost-conscious consumers a color screen, but offers little else by way of new features.

The success of the original monochrome Palm M100 proved that consumers have an appetite for inexpensive PDAs. The question Palm now asks is, How much more will budget shoppers pay for the M130, the company's first cheapo PDA with a color screen?

Externally, the M130 looks and feels no different than its no-nonsense, budget predecessors, the M125 and M105. But despite its budget status, the M130 seems plenty sturdy, if not capable of surviving a tumble from, say, your desktop onto a carpeted floor. The display itself offers a 16-bit color, backlit, 160x160 screen. Sure, the display is smaller than those of other Palm PDAs, but its bright and even backlighting helps alleviate the eyestrain that's typical of even larger monochrome screens. Unfortunately, unlike Palm's M515 or Sony's color Clie, the M130 screen doesn't support a reflective mode, resulting in a washed-out appearance when used outdoors.

With the introduction of the color screen, Palm had to switch from a pair of low-power AAA batteries to a rechargeable lithium-ion battery that charges when the unit is in its cradle. We found recharging rates to be fast, and run time was good for a color unit. Under the hood, the M130 offers the standard Palm fare: a 33MHz Motorola Dragonball VZ CPU, 8MB of memory, and OS 4.1. Like the M125 and the pricier Palms, the M130 also features an MMC/SD slot for expansion cards.

The PDA world is pretty much divided between two religions: Palm OS and Pocket PC, and most users have already signed up with one or the other for life. Because of their advanced hardware, Pocket PCs just can't compete with Palms when it comes to price. (The M130 can be had for as little as $235, whereas you'd be lucky to find a color Pocket PC for less than $400.) That said, while the M130 is a great beginner PDA for a student, we're disappointed to see yet another retread of the same Palm concept. What we have here are is nothing but a low-priced regurgitation of features we've seen before.

YABBA-DABBA-DO: Bright screen, low street price.

WOWZEE-WOWZEE-WOO-WOO Yet another baby step for Palm.

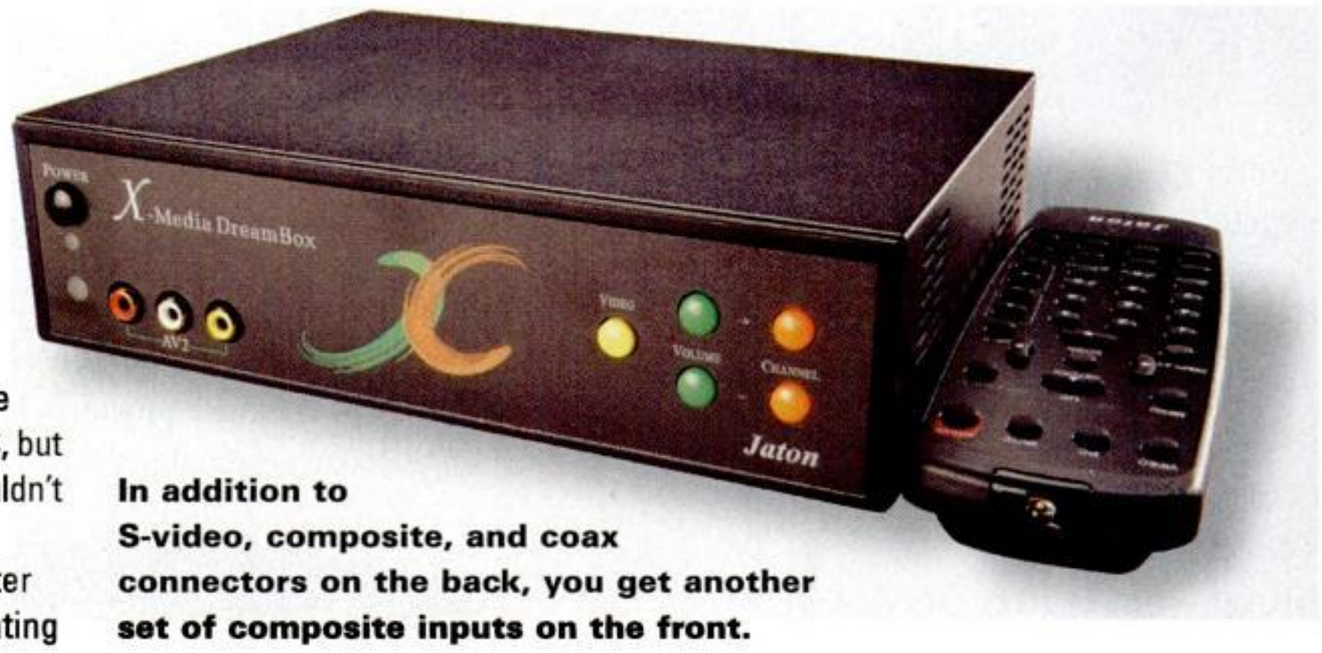
—GORDON MAH UNG

MAXIMUM PC VERDICT: 6

$280, Palm, www.palm.com

Jaton X-Media DreamBox

Make your monitor do double-duty



In addition to S-video, composite, and coax connectors on the back, you get another set of composite inputs on the front.

Many eons ago, troglodytes carrying fire sticks were considered to be gods, so valued was their technological superiority. Your friends will surely bestow upon you the same awe and reverence when you show them that you can watch TV on your PC monitor—*even* when the PC is turned off. Sure, you could slap an internal TV tuner card into your PC, but you'd still have to boot up your computer just to watch "Buffy." And this wouldn't impress anybody.

Even though it has its quirks, Jaton's X-Media DreamBox is a far better external TV tuner than is the AVerTV Box, which received a severe beating in our January issue for its poor visual quality, 800x600 resolution limitation, and a picture-in-picture image that can't be repositioned at will. The DreamBox beats the AVerTV Box in every single category (although both devices have names that are way over-capitalized).

The DreamBox gets cabled between your PC and monitor (CRTs and analog LCDs are fine; digital LCDs need not apply). You then plug your cable TV, DVD, and game console signals into the DreamBox's coaxial, S-video, and composite video inputs. Because the box completely bypasses your computer, your rig doesn't have to be powered on. But if you like, you can watch TV on your Windows desktop, in either full-screen or picture-in-picture mode, which superimposes a resizeable, repositionable screen over all your icons. (Because the DreamBox signal is streamed directly to your monitor on top of the PC's signal, your video window will always appear on top).

There's a serious restriction to the PIP scheme: It works only at a maximum desktop resolution of 1024x768. So, if you're running at a higher res, you'll have to manually downshift to receive video input. Jaton recommends running the refresh rate at 60Hz, but we found we could push it up to 72Hz before we saw scan-line bleeding.

Sound quality was fine, but the initial picture quality we got from the DreamBox made Super-8 porn from the 1970s look great by comparison. We dialed out a color cast problem and refined the picture using the DreamBox's video display settings. The process was a pain, but the resulting picture was indistinguishable from a high-end TV set.

We still recommend buying an internal TV tuner card, if only to enjoy the software and advanced time-shifting functions that you'll get with it. But if you don't want to give up a motherboard slot, and are insistent on watching TV on your computer monitor when your computer is turned off, the DreamBox can give you the world.

JULIA-LOUISE DREYFUS After initial tweaking, the picture quality will make even your Superbit DVDs proud.

"WATCHING ELLIE" Limited resolution support means a lot of manual video-setting adjustments. Device lacks many features found in internal cards.

—LOGAN DECKER

MAXIMUM PC VERDICT: 6

$150, Jaton Corp, www.jaton.com

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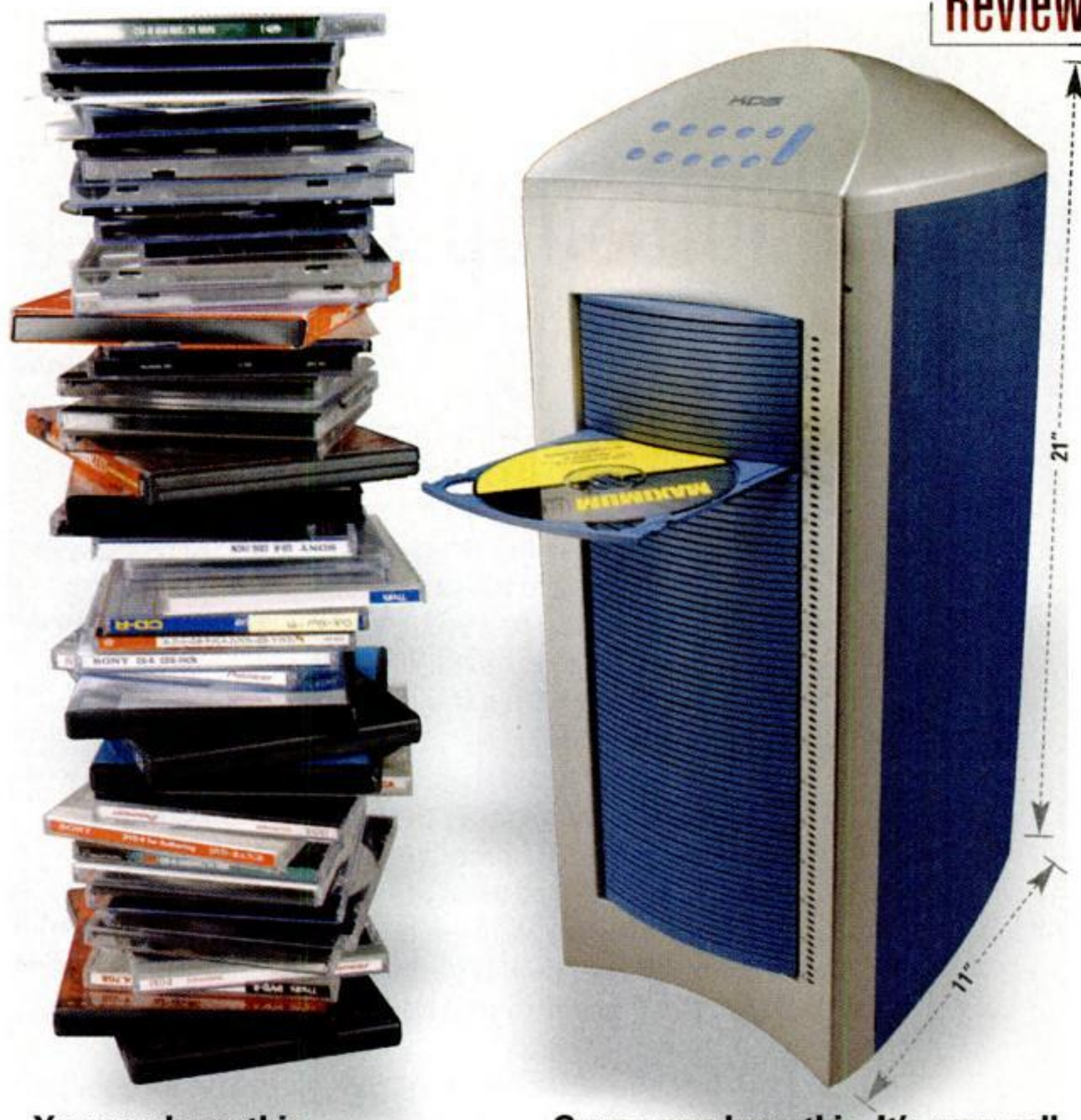

You can have this... **Or you can have this. It's your call.**

If you're enough of a power user to be reading this magazine, then you've undoubtedly got a large collection of data CDs. Some are nicely alphabetized in a binder, but most are strewn about your house—on top of the fridge, underneath the coffee table, and directly in the flight path of your desk chair's casters. If any of this sounds familiar, then you're ready for the USB-based CD Organizer from KDS, an "intelligent" CD tower if there ever was one.

It may look imposing in that stoic, Federal Building way, but it's actually a very simple, if not elegant, device. Seventy-five disc trays are stacked one atop the other. Behind the trays sits a motorized mechanism. Dial in the disc you need via a Windows applet, and the mechanism repositions itself behind the appropriate tray, then scoots out the disc.

So how do you know which tray has the disc you need? Well, before you load a disc into the organizer, you pop it into your PC's optical drive and scan it with the Organizer's bundled software. The software reads the table of contents from your CD—sparing you a time-consuming and frenzied disc inventory—and loads it into its database. The Organizer applet sits in your system tray, ready for you to click it and request a file or disc. Whether you enter "Jedi Outcast" or "grandcanyon.jpg" into the search field, the longest you'll have to wait for the mechanism to travel from the first tray to the 75th tray is three seconds.

Disc titles can also be entered by hand without an inventory. This is a good strategy if you don't want to take stock of the entire contents of a game CD, or if you're storing a non-PC disc. You can also categorize discs with preset or custom categories for easier searching ("games" or "X-10 cam images," and so on). If you have multiple Organizers plugged into your PC, the software will search through them all.

The KDS CD Organizer isn't just an efficient secretary—it's also a stern disciplinarian. If you've pulled a disc to lend to a careless friend, a software menu option can indicate that the disc is being borrowed. You can also record who received the disc, when you'd like it back, and when you'd like a reminder to sic collections on the recipient. Discs can also be retrieved with the PC off, if you have a good memory. A numeric keypad at the top will release any disc to you as long as the unit itself is plugged in.

The CD Organizer unit does not—repeat, *does not*—actually read your discs. If you think about it, that's a good thing. Not only would such a contraption be heinously expensive, but you'd also be restricted to inserting only discs that the device could read. In fact, the Organizer will store *any* kind of disc: CDs, DVDs, PlayStation, Gamecube, Xbox discs, etc.

But we wouldn't be *Maximum PC* if we didn't have complaints: Because the Organizer doesn't read discs, you have to either put discs back in exactly the right slots, or re-inventory your software. Also, none of the Organizer trays have appropriate indentations for storing the standard 3-inch mini-CDs that some companies use for driver discs. And the bundled software is unable to automatically extract movie titles from DVD-Video discs (although it did fully catalog our DVD-R data discs). Finally, this thing is big. At 21x11x7.5-inches, we'd need three pages to show its actual size. But that's OK with us. Epic problems require epic solutions.

—LOGAN DECKER

What to do with all those CD booklets? Logan uses his Caselogic CD binder to file them away in the same order as our CD Organizer discs.

MAXIMUM PC VERDICT

CD Organizer
KDS USA

+ BILL MURRAY

If you have more optical discs than you have fingers and toes, the CD Organizer can transform your life by doing the dirty clerical work for you.

– TOM GREEN

The unit itself is big and not too pretty—just like some of our best friends.

www.kdsusa.com
$150
9

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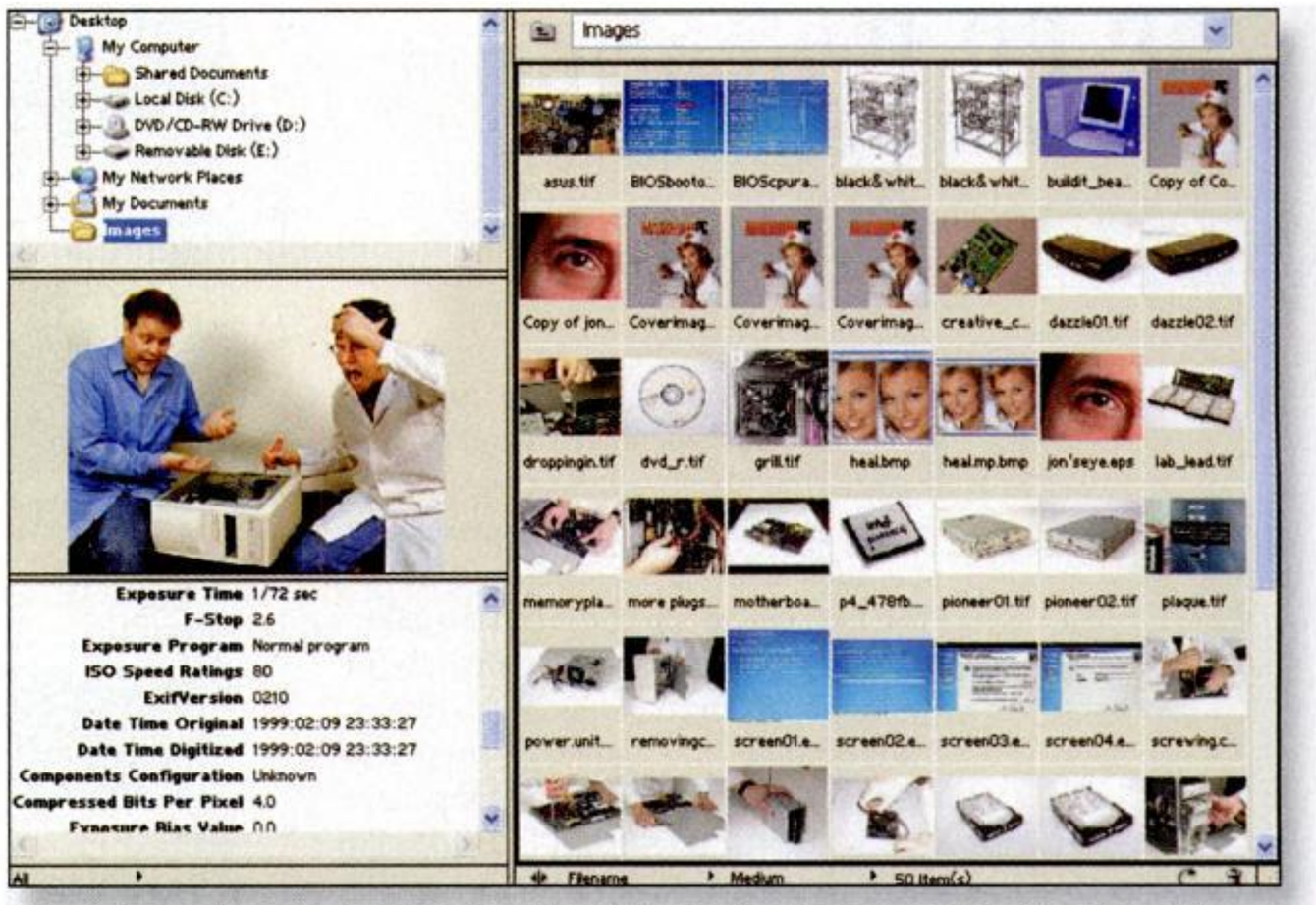
Adobe Photoshop 7.0

Who couldn't use a bit of plastic surgery?

If you've grown up with *Photoshop* like we have, you'll probably get a sense of déjà vu when you break open the shrink-wrap covering version 7. Will the update to Adobe's flagship image-editing app be a true upgrade, or will it be just a reshuffle of tools and menus, along with a few features that no one will use?

We're happy to report that *Photoshop 7.0* does much, much more than just rehash old tricks. The premier photo editor for PC and Mac users alike has something for everyone—a bevy of new tools and functionality across the board, and extra polish that adds efficiency to tedious tasks.



An integrated and powerful file browser saves you the trouble of loading *ACDSee* or another external viewer.

In the "better late than never" category, Adobe has finally incorporated a file viewer for browsing the images on your hard drive. The app is fully integrated into *Photoshop* proper, and eliminates the need to Alt-Tab to a separate image viewer such as *ACDSee*. We're not talking about a bare-bones viewer, either. You can manipulate thumbnails, view image properties, organize files in half a dozen different ways, and even add your own personal preference ratings. The file browser also supports the Exchangeable Image File format (EXIF) that digital cameras embed in images. This means you can now view details such as what camera was used to shoot a picture, the flash settings, the F-stop, metering, and focus point. Also very handy are new options for batch renaming of multiple files; you can finally toss out all those pesky thumbnailing and "auto-renaming" proggies you've been using on the side.

The Healing tool in version 7.0 lets you effortlessly remove wrinkles and other blemishes.

Graphic artists have been buzzing about the new Healing tool, which magically erases wrinkles, blemishes, and other imperfections faster than a Hollywood plastic surgeon. The Healing tool is similar to the Cloning tool, in that you select a "good" source area to be pasted over a "bad" target area. But instead of just pasting an exact duplicate of the source (which is what Cloning does), the Healing tool tweaks the color and tonal values on your good sample, so it blends in seamlessly with its new surroundings. Guess what? It works. Or at least well enough to clean up the editor-in-chief's wrinkles.

Those of you who like the simple efficiency of Auto Contrast and Auto Levels for speedy image tweaks have a new sibling for your quick-tweak family: Auto Color. This is a no-fuss, one-button fix that automatically removes color casts from an image. For example, applying Auto Color to an old photo yellowed by age will return it to its original neutral color values. It won't save pictures that you spilled fruit punch on, but just like the Healing tool, Auto Color can save you hours of tedious work.

Adobe first got serious about the web with *Photoshop 5.5* and continued that trend with version 6. With 7.0, the company integrates a number of features that are particularly useful for webmasters. The pattern maker is handy for creating seamless tiled backgrounds from any image or selection. Also useful is a web gallery template that lets webmasters whip up non-cheesy-looking thumbnail galleries and slideshows without leaving *Photoshop*. There's also a new dithered transparency feature that lets you easily blend images or graphics against backgrounds.

Under the hood, Adobe says it has tuned *Photoshop 7.0* for better performance under Windows XP, but the engine is essentially still the same. The major changes happen on the Macintosh side of the fence where Adobe did a major overhaul to take advantage of OS X. For OS X users, *Photoshop 7.0* is an absolute must-have. For Windows users, upgrading isn't quite as mandatory, and you'll have to weigh the benefits based on your requirements. If, say, retouching photos is a primary concern, then upgrading is a no-brainer. Other useful extras—such as the ability to save your own brush settings, crop tool templates, and even multiple workspaces—go a long way toward improving your work environment and enhance an already mature application.

Adobe has proven once again why *Photoshop* remains the choice for graphics geeks everywhere and is the only image editor you'll ever need.

—ASIA CARRERA

MAXIMUMPC VERDICT

Photoshop 7.0
ADOBE

PLUSES

The Healing tool and file browser are welcome additions to the premier photo editor.

MINUSES

Steep learning curve for beginners, and *ImageReady* (Adobe's bundled web graphics app) still isn't integrated into the main program.

www.adobe.com
$609 ($150 upgrade)
9

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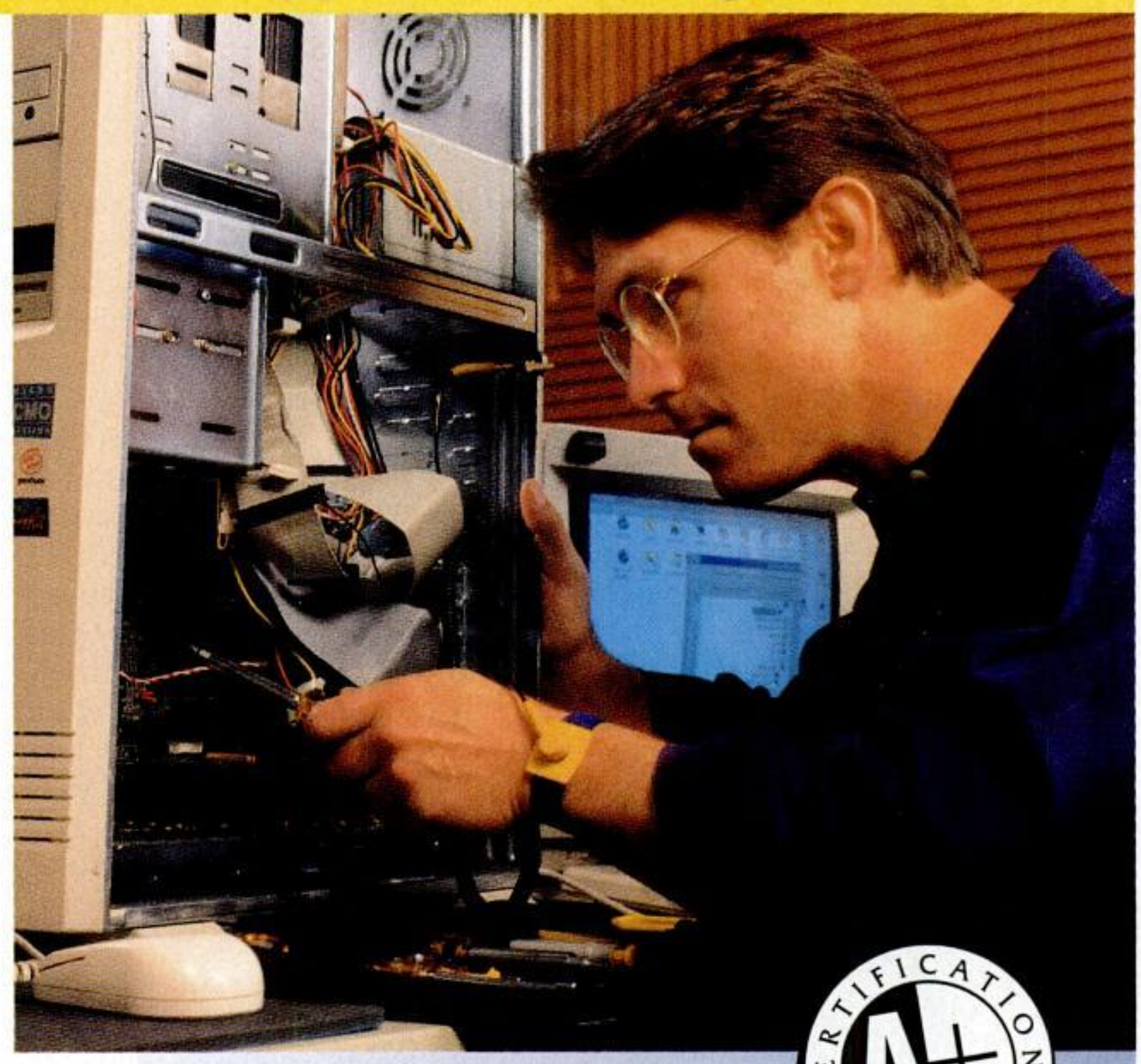

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Dungeon Siege

All the RPG goodness without the RPG tedium

Role-playing games have been enjoying a semi-renaissance of late, and not all of them shove byzantine magic systems and unwieldy item-management chores down your mead-loving throat. More and more, we've been seeing "RPG Lite": The new emphasis is on action and adventure, not traditional RPG bookkeeping bureaucracy, and every serf in the kingdom is the better for it. All of which leads us to Gas Powered Games' *Dungeon Siege*, a new-school RPG of the highest order.

The action takes place in the kingdom of Ehb, home to the Tenth Legion as well as the troublesome Seck. Much smack was laid down, and the Seck vanished—but odd things have been happening lately. You start the game as a humble farmer, and the story develops around you—it wouldn't really be an RPG if you weren't the hero, after all. Nine chapters, comprising roughly 30 hours of gameplay, await your exploration.

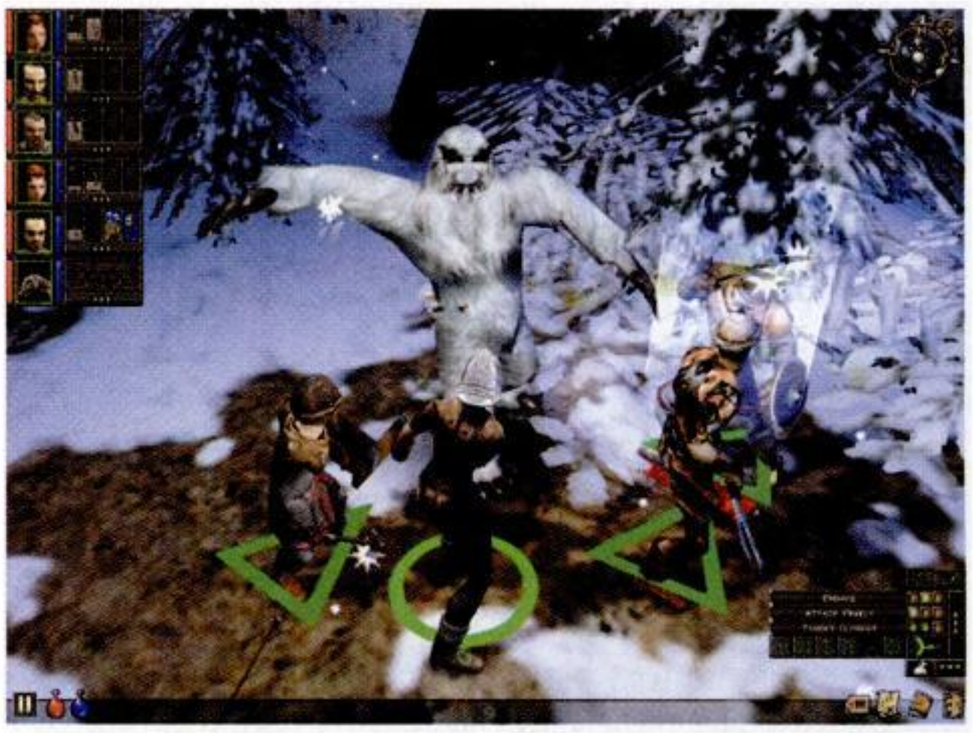
Dungeon Siege departs from the norm by removing toilsome decision-making right from the get-go—just pick your gender, name, and clothing. Your character grows by performing the actions you wish to develop. Want to be a melee fighter? Good. Just grab that blade and lay waste. Is sorcery more your bag? Fine. Just find a spell and start flinging it around. Practice makes perfect, and the more you use a skill, the better you get at it. Your statistics improve the same way: Characters with fighting inclinations get bulkier and faster, while the wispy mages are sickly and pale but really smart. The only choices you need to make are during actual combat and interaction; the game takes care of the rest.

Dungeon Siege concentrates on the gameplay in other ways as well. Inventory management is a thing of the past. You can buy pack mules to cart around your loot, and the game even has a key for what amounts to "everyone toss everything on the mule and let's roll." Combat and exploration are strongly reminiscent of RTS titles, with provisions for formations, different battle stances, fog of war, and hot-keying among sub-groups.

Beginning an adventure in mismatched armor.

Gameplay is fast-paced and intuitive, but *Dungeon Siege* really shines under the hood. Modeling and animations are smooth and fluid, especially in combat, and the texturing is meticulous and well-rendered, down to the individual scales on a piece of armor. Water and different types of metal also look just like they should, in large part due to fantastic lighting and reflections. Because maximum resolution is limited to 1024x768, all that graphical splendor won't bog down your box (though, if you want to get crafty, you can increase resolution by tweaking the .ini file). In any case, the game didn't hitch at all on a 1.3GHz Athlon box armed with 512MB of memory and a GeForce3 Ti 500.

Dungeon Siege's biggest technological achievement is the removal of loading times. The game doesn't include any levels; you simply get a "Preparing World" message when you fire up the game, and that's it. In fact, if you have the patience, once you've beaten the game, you can literally run all the way back to the start! Actually, you'll need patience regardless, because the world is huge. Unfortunately, the game also plays like a tunnel shooter—you have some small side quests, but for the most part *Dungeon Siege* is extremely linear. But on the bright side, it's also seriously mod-friendly, and with the imminent release of tools and a level editor, it's a sure bet we'll see some top-notch player-created material.



This creature isn't quite big enough to be a Yeti, but it'll do. It'll do.

Uh, we'll wait for the next elevator. Thanks all the same.

Fast, easy multiplayer is handled through a direct connection or Microsoft's Gaming Zone. The multiplayer mode offers an entirely new campaign, and *Dungeon Siege* handles latency well, even on a 56k connection. The only downside to multiplayer is that it doesn't have a save-game option, so running extended games with friends can be problematic.

Smooth, intuitive gameplay flattens out the learning curve, top-notch graphics and sound pull you in, and the streamlining of RPG tedium (coupled with the absence of levels loading) makes *Dungeon Siege* a "What, it's 4 a.m. already?" title.

—BILL MCCLENDON

MAXIMUM PC VERDICT

Dungeon Siege
GAS POWERED GAMES/MICROSOFT

+ MAGIC MISSILE

Drop-dead gorgeous; fast, intuitive gameplay; no level loading; very hard to put down; mod-friendly.

– STINKING CLOUD

Simplistic story, and the Goblin segment is ass. No saves in multiplayer. Painfully linear.

www.dungeonsiege.com
$50

9

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Tony Hawk Pro Skater

A skateboarding game for anyone who loves gaming

Here's Tony in mid-move, high on the top deck of the cruise ship level. Notice the sweet shadow and the nicely anti-aliased rails.

You say you don't know how to bust a front-side grind, and you can't tell an ollie from a kickflip? No worries. *Tony Hawk Pro Skater 3*—the quintessential arcade-style skateboard sim—is still one of the most entertaining, replayable, just-plain-fun games that's come out this year. And the graphics in the PC version humiliate the graphics in all the console versions.

Gameplay is simple: Do tricks, earn points. Pull off a more complex trick, and get more points. Stringing together several tricks into combos can boost your score even further. All this action takes place in a series of vividly rendered, oftentimes skater-hostile levels. Seriously, how'd you like to skate inside an airport?

When you first fire up *Tony Hawk,* you have access to only one level, the steel foundry. Don't fret, though, because the map has dozens of rails to grind, ramps to jump, and objectives to complete. Completing a certain number of objectives will unlock the next level. Each level contains nine objectives, ranging from the very simple (e.g., collecting three items from around the map) to the super-complex (e.g., finding and grinding four secret rails that will trigger an L.A. earthquake).

Thankfully, unlocking the next level never requires one-hundred-percenting your current level; you only need to complete between three and six of the nine possible objectives. However, finishing all your goals does open secret maps and gives you access to more tricks and better boards. Unlike other puzzle-based games we've played recently (see last month's *Jedi Outcast* review), *Tony Hawk* provides just enough hints to be challenging without being frustrating.

Multiplayer online modes add to the game's already impressive replay value. You can join eight-way matches in seven different multiplayer modes, ranging from the team-based King of the Hill to the deathmatch-esque Slap! Mode, where your only goal is to plant your board on a buddy's face. Make sure you pick up the 1.01 patch for optimal net gaming. The version that shipped with the game crashes every time you try to connect.

Like its console counterparts, this PC version uses the Renderware game engine. On the PC, you get all the same skeletal animation and the nifty fogging, but even higher-resolution models than on the console versions. And of course, on a PC you can also turn on anti-aliasing if your videocard can handle it. With anti-aliasing enabled at 1280x1024, *Tony* looks infinitely better than on the Xbox or PS2.

There's just one catch: To play the game well, you need a gamepad. We recommend a pad with an analog stick and eight buttons minimum. *Tony Hawk Pro Skater 3* is a must-have PC title for shredders and bi-peds alike. That's really all there is to it.

Later, skater. It's time to unlock some more secret levels.

—WILL SMITH

MAXIMUM PC VERDICT

Tony Hawk Pro Skater 3
ACTIVISION

+ 900 HARDFLIP + METHOD TO REVERT

It's a console port, but it's a console port of one of the most fun console games of the past year—and it adds great multiplayer to an already endlessly replayable game.

– 180 OLLIE

Requires a gamepad for proper play. Besides multiplayer, the PC version doesn't add any new PC-only content.

www.activision.com
$40
9

THRUSTMASTER DUAL ANALOG

MAXIMUM PC KICK ASS PRODUCT

Try to play a game like *Tony Hawk Pro Skater 3* with anything less than a perfect gamepad, and you'll be ass-out on the ass-phalt. In fact, you'd probably have better luck by randomly smashing your face on the keyboard. No, for a console port like *Tony Hawk,* a gamepad like the Thrustmaster Dual Analog is absolutely required.

This pad's design includes all the usual suspects—two analog sticks, one D-pad, four thumb buttons, six triggers, and a mode button—all in a comfortable configuration. But it's the analog stick that's de riguer for *Tony Hawk.* You simply can't pull off nuanced tricks with the nonprogressive action of a digital D-pad.

The Dual Analog doesn't include any fancy force-feedback effects, but its soft plastic exterior is just the right size and shape to comfortably fit in most hands, even after several hours of heavy gaming. Most importantly, its layout will be familiar to anyone who's played with either a PlayStation, PS2, or Dreamcast controller.

The Dual Analog is even supported under Windows XP with no need for drivers, although you can still use the Thrustmaster software to program each button and axis if your games don't allow you to do so. We just haven't seen a better non–force feedback analog gamepad for the PC.

MAXIMUM PC VERDICT: 9

$25, www.thrustmaster.com

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Software Freak of the Month

EarthViewer 3D

What in the world...?

Hold onto your seats! With *EarthViewer 3D* you can travel from very far away to quite close up in mere seconds.

With all the excitement the *EarthViewer 3D* software generated in the Lab, you'd think we were running *Doom III* on our test beds. Indeed, not one of us jaded, "been there, done that" PC snobs was immune to the program's wonders. Imagine being able to select an actual photographic image of the globe, then zoom in on a specific locale—with the details of real-life landmarks, buildings, and even cars taking shape before your very eyes as you move in on your target.

Similar to Terraserver.com, *EarthViewer* uses an online connection to feed you satellite images from around the world. But unlike Terraserver images, the *EarthViewer* images are part of an organic whole. They load faster, offer more detail, and appear in color, making for a far more dynamic and satisfying experience. *EarthViewer 3D* offers a more fluid presentation than Terraserver because the application was designed from the bottom up for broadband connections (this, of course, makes DSL or cable a requisite). In fact, it takes no more than a few seconds to zoom from an omniscient view of the entire globe to a close-up view of your hometown. Try the same thing on Terraserver.com, and you'll be waiting for a series of painfully slow screen redraws.

MAXIMUM PC KICK ASS PRODUCT

The app requires a 3D card armed with at least 8MB of memory (16MB is recommended). There's no visual advantage to having a card with programmable shaders, but any fast card with loads of RAM will likely speed up the tilt, move, and rotate features that the program offers. Yes, you heard right: *EarthViewer 3D* allows you to view your target area from a number of different perspectives, even horizontally. You can zoom in, then tilt the image, positioning it as though you were standing on the ground and looking out at the horizon. This way you're able to see all the hills, valleys and strip malls that make up the surrounding terrain.

EarthViewer 3D combines several different maps to provide this immersive experience. Images from as far as 15 kilometers to as close as mere meters from the Earth's surface comprise the program's global view. You can also view optional roadmaps, as well as information about a specified area's dining, recreation, public services, and so on, assuming the info is available on an *EarthViewer*-affiliated database.

By far the most impressive aspect of *EarthViewer* is its high-detail, close-up imagery—we were able to focus in on our homes and apartments! Unfortunately, high-detail photos currently make up less than 10 percent of the entire library, and are confined to our country's top 50 metropolitan areas, as well as international points of interest, such as Paris, Tokyo, and Afghanistan. A rep for the program says new maps are added on a regular basis to meet the demands of *EarthViewer* customers. Which raises the question: Who *are* the program's customers?

The Professional version that we reviewed is marketed to realtors, city planners, and travel agents—just the type of people who might be able to justify its $600 annual price tag. But by the time you read this, a consumer version should also be available for $100 per annum. The scaled-down version will offer the exact same imagery, but restrict map-annotation features and export options (such as the ability to e-mail or print what appears on your screen). That said, this is an ideal program for extensive travelers, geography nuts, and shut-ins alike.

—KATHERINE STEVENSON

MAXIMUM PC VERDICT

EarthViewer 3D Professional
KEYHOLE INC.

+ OUT OF THIS WORLD
Fast image loading and close-up views make for an entertaining program.

– THE PITS
Too pricey to be used just for fun.

www.earthviewer.com
$600 a year (Consumer, $100 a year)

9

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800-284-2257

www.ADAMANT.COM

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- Enhanced keyboard and Mouse
- Microsoft Windows ME or 98SE
- Free Upgrade to Windows-XP Home Edition
- Free Software: PC Works Suite-2002

Includes: Word Processor,Spreadsheet, Event Planner, Database, Presentations and more...

- 3 Years Parts, Lifetime Labor Warranty
- (Gold and Black Color Cases available)

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AMD Athlon™XP 2000+	$1089
AMD Athlon™XP 2200+	$1169

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- 40x12x48 TDK VeloCD CD-RW Drive
- 128MB 4x AGP Nvidia GeForce4 T14600
- 56K V.92 Zoom PCI Modem
- Sound Blaster Audigy Sound Card
- 10/100 PCI Fast Ethernet Lan Card
- Digital 6 CH Sound Card w/OpticalConnector
- Klipsch 5.1 Digital Speakers w/Subwoofer
- Aluminum Case w/500W Dual Fan PS, temperature LCD Panel and Fan Speed
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- 64bit AC97 3D Sound Card
- 10/100 PCI Fast Ethernet Lan Card
- Multimedia PC Stereo Speakers
- Enhanced Keyboard and Wheel Mouse
- Microsoft Windows ME or 98SE
- Free Upgrade to Windows-XP Home Edition
- Free Software: PC Works Suite-2002

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- (White and Blue Color Cases available)

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Pentium®-4 2.2GHz	$1169

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- 17" XGA LCD Flat Screen Display
- 16x Max DVD-ROM Drive
- 128MB GeForce4 TI4600 AGP Graphics
- Sound Blaster Audigy Sound Card
- 56K V.92 Zoom PCI Modem
- Intel® 10/100 PCI Fast Ethernet Lan Card
- IInspire 5300 Digital Speakers w/Subwoofer
- Enhanced keyboard and Wheel Mouse
- Microsoft Windows ME or 98SE
- Free Upgrade to Windows-XP Home Edition
- 3 Years Parts, Lifetime Labor Warranty
- (White and Blue Color Cases available)

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40GB	7200rpm	SV4004H	★ $86
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80GB	7200rpm	SP8004H	$127
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24x10x40	IDE	Sony CRX175A2/C1	$112	$152
24x10x40	IDE	Plextor PXW2410TA/SW	★ $132	$147
24x10x40	IDE	Yamaha CRW3200EZ	$155	$195
32x10x40	IDE	Acer 3210A	$99	$139
32x12x40	IDE	Lite-On LTR32123	$86	$126
32x10x40	IDE	GoldStar GCE8320BI	$108	N/A
32x10x40	IDE	Sony CRX185A1/C1	$123	$163
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40x12x48	IDE	TDK VeloCD	$139	N/A
40x12x48	IDE	Lite-On LTR40125S	★ $106	$146
40x12x48	IDE	Teac CDW540E/KIT	$114	$154
40x12x48	IDE	Pacific Digital U-30121	$128	$168
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24x10x40	SCSI	Yamaha CRW3200SZ	$278	$318
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16x/40x	IDE	Pioneer DVD Tray DVD116	$65	$90
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18.4GB	15,000rpm	ST318452LW	8mb	$250
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Matsonic	MS-8308EP	$60	MS-8137C	$70
	MS-8308E	$57		
Gigabyte	GA7DXRP	$138	GA7IXEH	$64
	GA7VTXHP	$104	GA7VRX	$106
MSI	K7MASTER	$82	K7N420PRO	$143
	K7T266PRO2	$109	K7T266P2RU	$130
	MS6380E010	$112	MS6380E020	$146

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Intel	D815EGEWU	$96	D815EGEWLU	$109

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	GA8IRXP	478	$159	GA8ITXE	478	$130
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INSPIRE5700, 6 Piece Digital 5.1	79W	$242
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QPS	80GB	Ultraslim 7200rpm Retail	$262
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Buslink	80GB	Desktop USB Hard Drive	$239
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QPS	LS240	SuperDisk USB	$148

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Pacific Digital	32x12x48	USB 2.0 CD-RW	$209
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Iomega	24x10x40	USB 2.0 CD-RW	$197
Sony	24x10x40	USB 2.0 CD-RW	$212
QPS	Que! 24x10x40	2.0 CD-RW	$169
QPS	Que! 32x10x40	2.0 CD-RW	$180

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Athlon XP1900	$150	P4 | 2.0GHZ | .13 | 478	$317
Athlon XP2000	$195	P4 | 2.2GHZ | .13 | 478	$469
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ATI	Radeon 8500DV AIW 64MB AGP	$335
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EVGA	GeForce3 Ti200 64mb DDR	$195
EVGA	GeForce3 Ti 64mb DDR w/Tv	$205
EVGA	GeForce3 nVIDIA 64mb DDR	$339
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Pine Tech	GeForce3 Ti500 64MB Verto	$289
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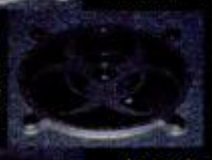

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92mm $20
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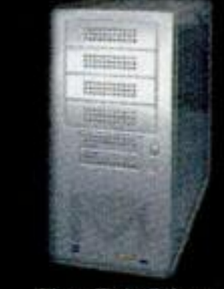

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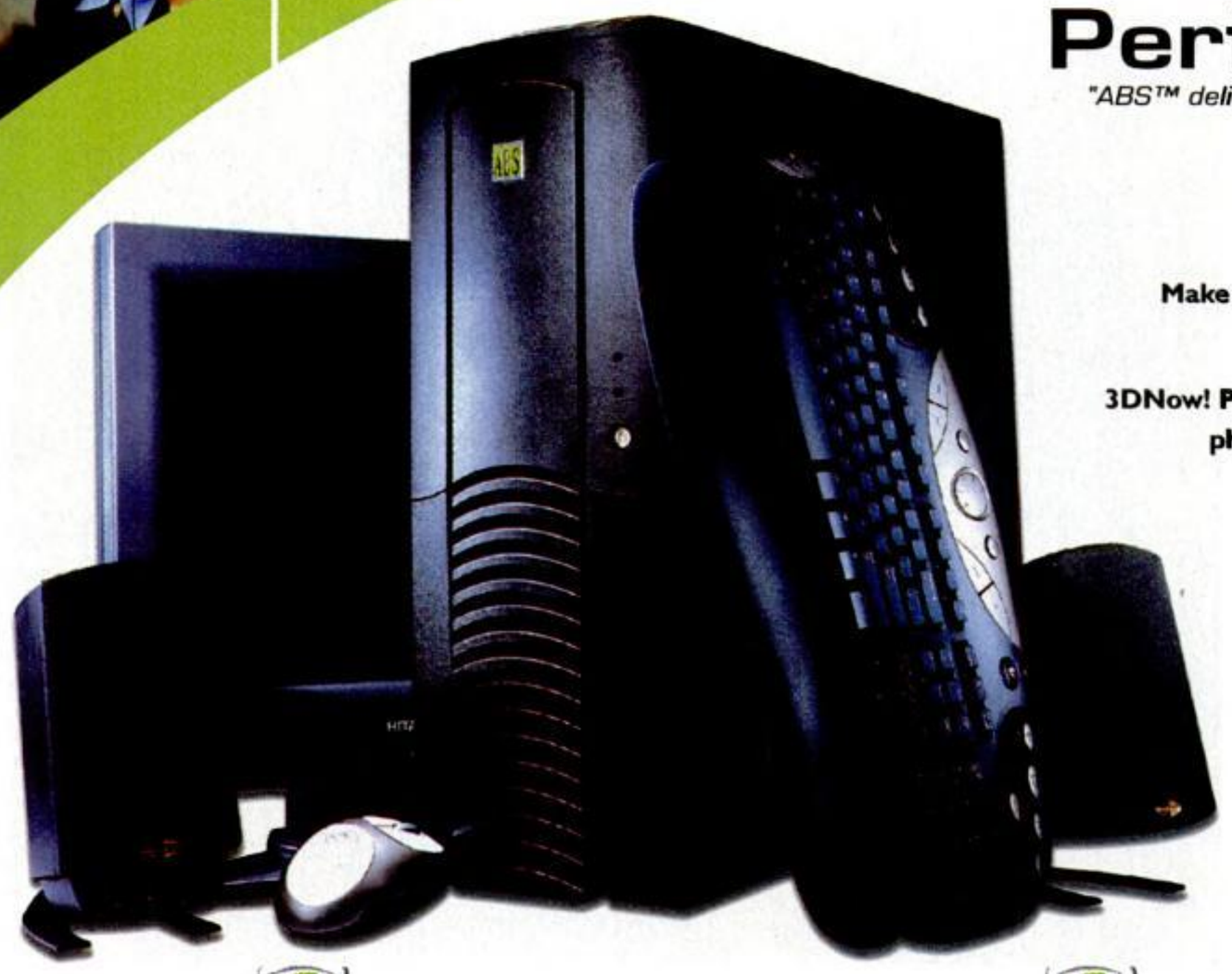

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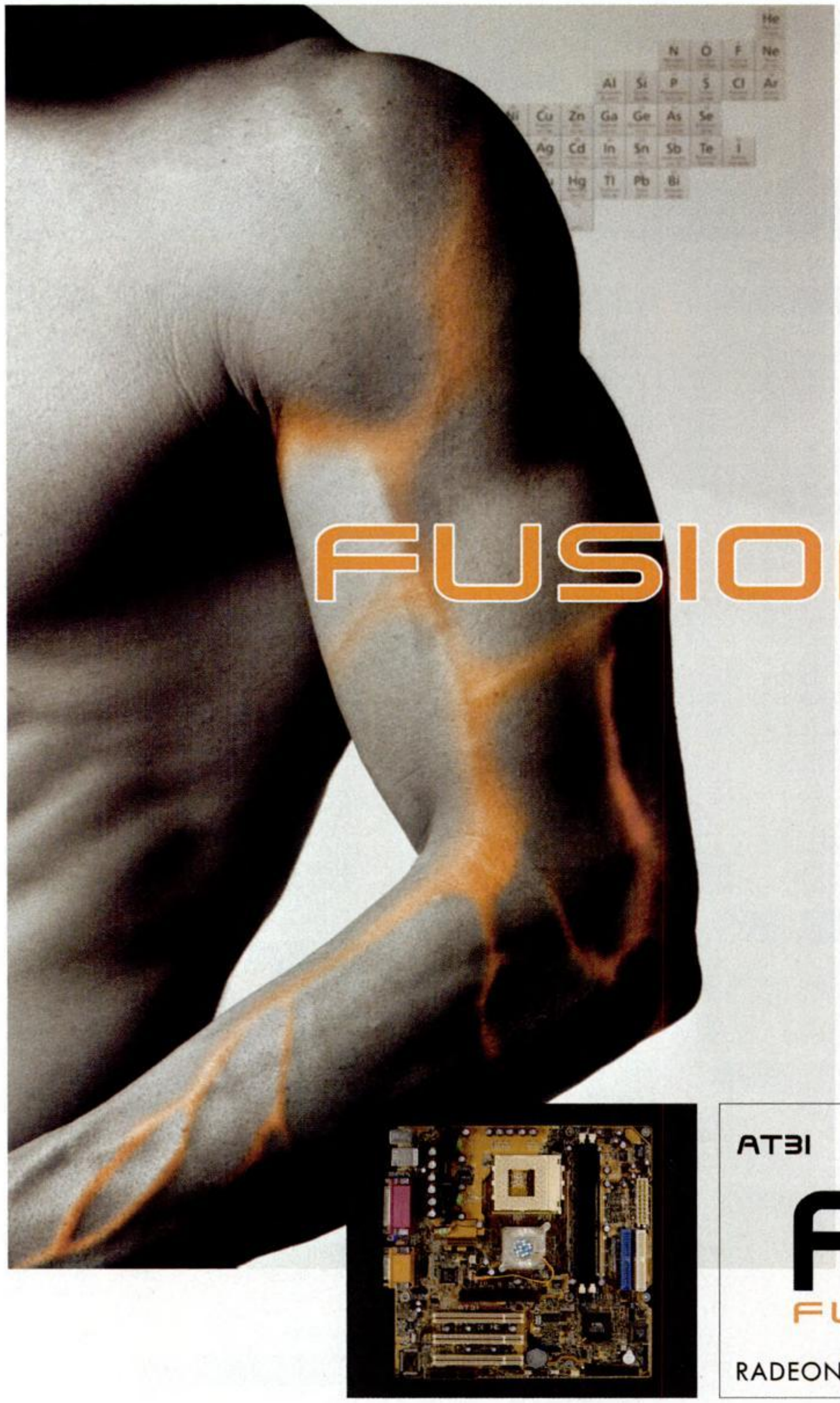

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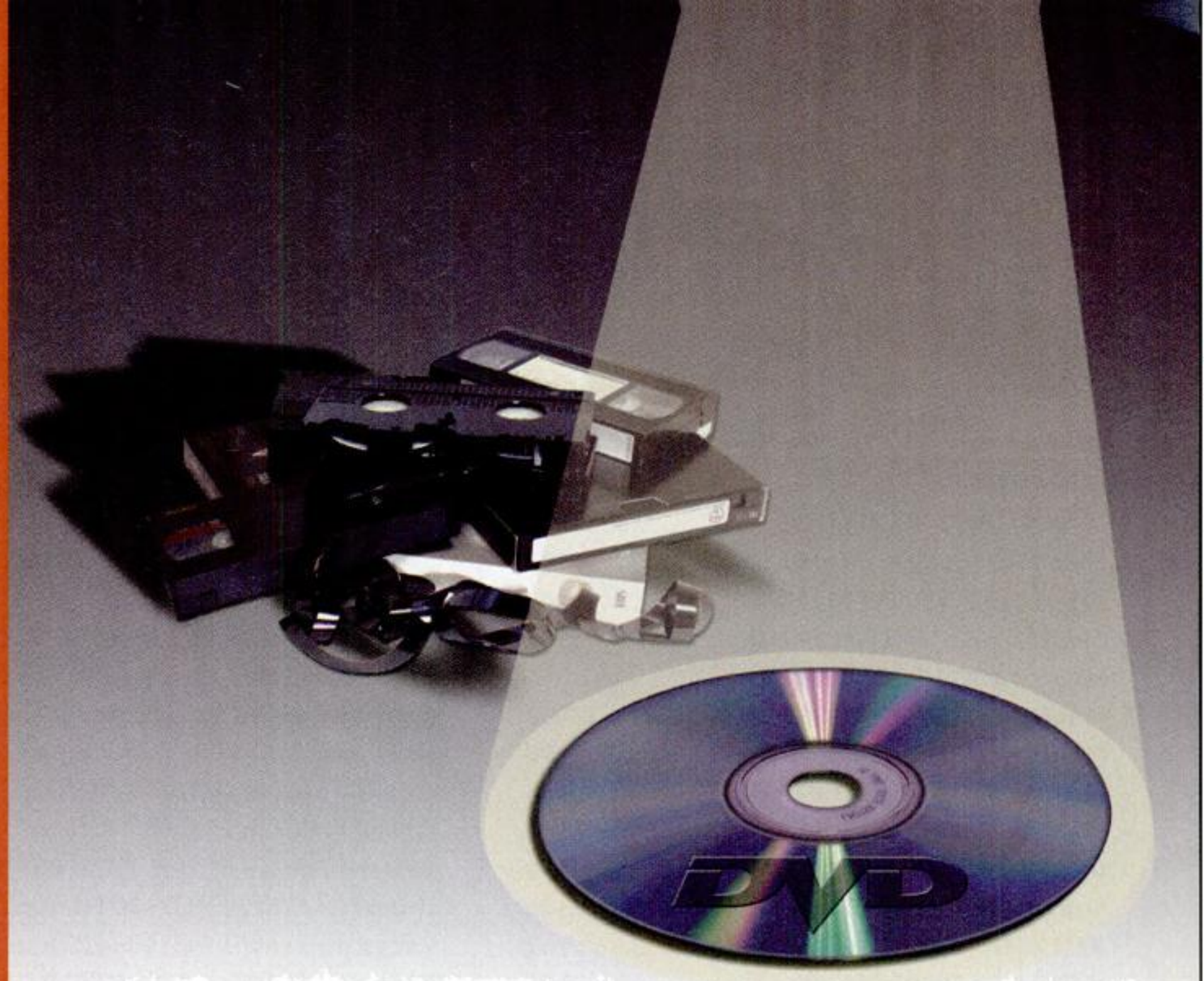

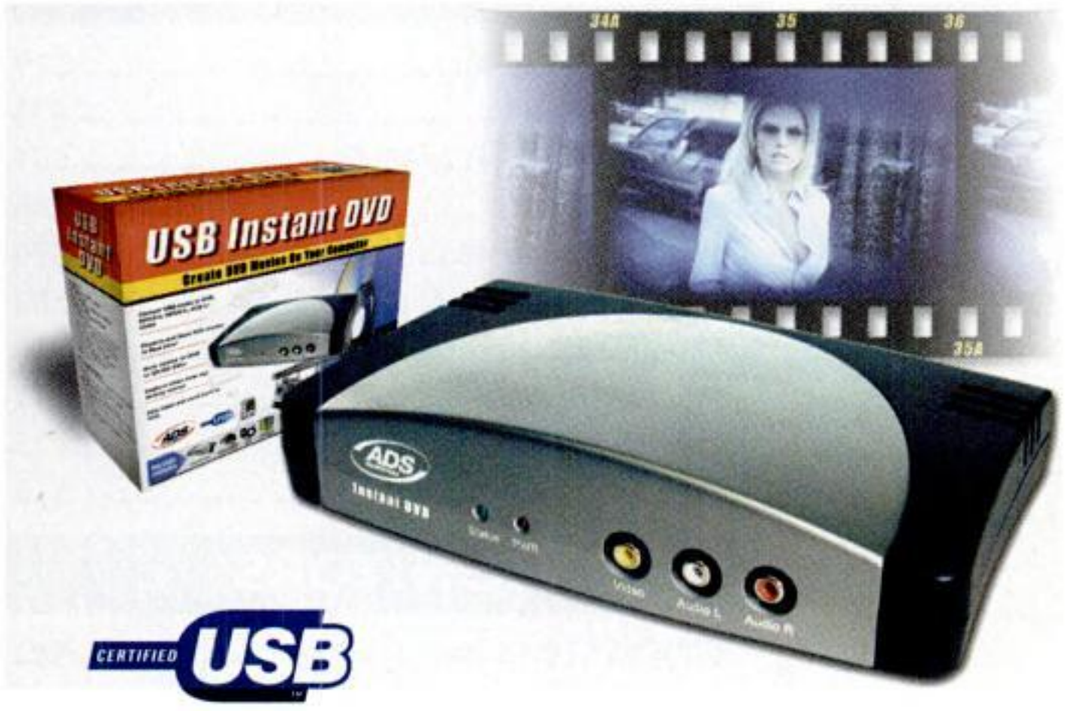

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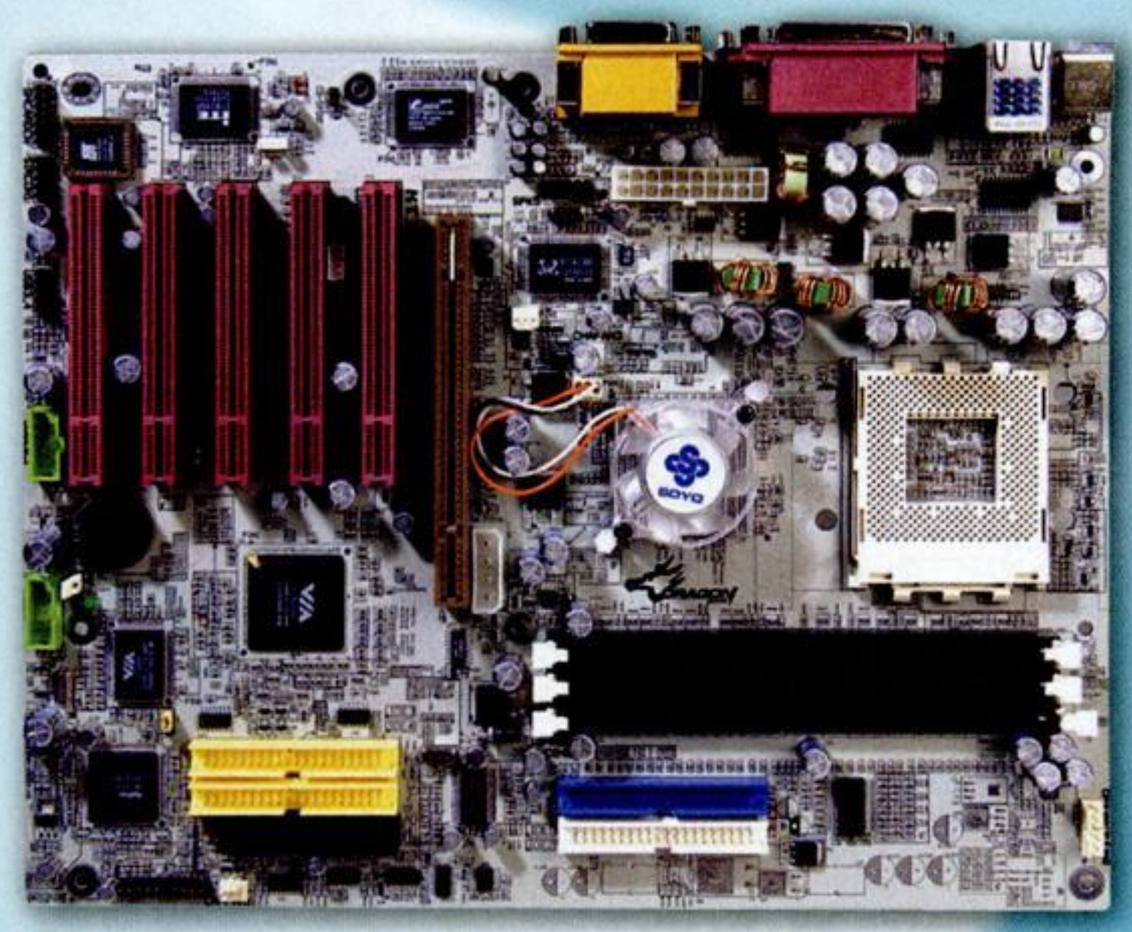

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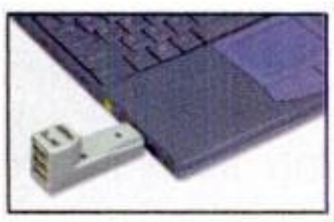

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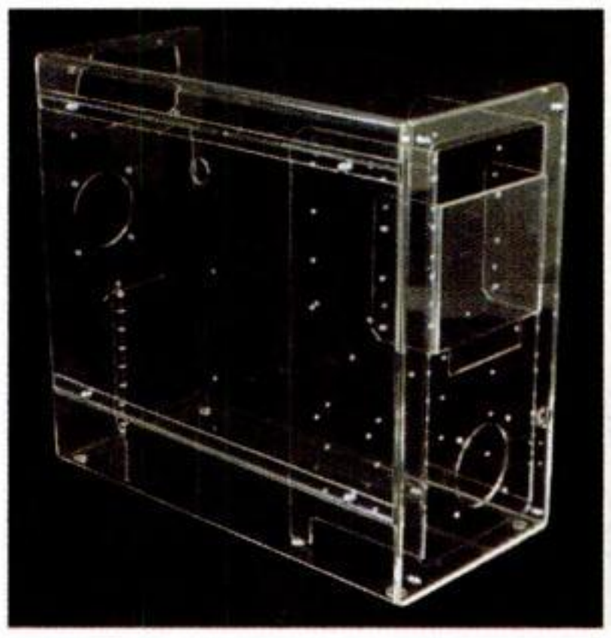

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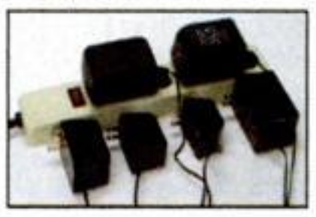

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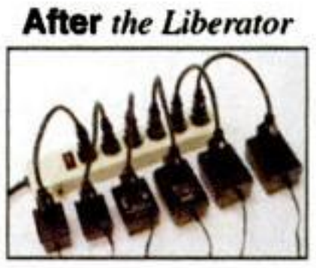

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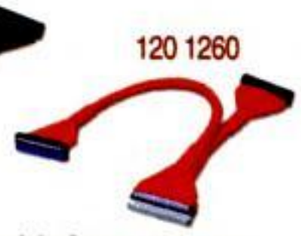

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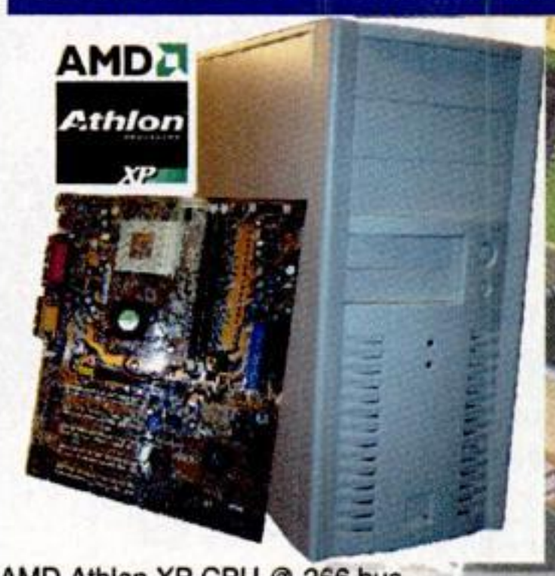

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MODEL/ SPECS	Bare Bone	Dimension W.D.H	I/O ports	5.25"	3.5"	PCI	PCI ISA
105LPX socket 370	255	12x13x3.1	PS2 KB,mouse,VGA,USB,RJ45 2S,1P,AUDIO, GAME	1	1/1	3 or 0	
105LPX TV	275	12x13x3.1	PS2 KB,mouse,VGA,USB,RJ45 2S,1P,AUDIO,GAME,TV	1		3 or 0	
107S37	395	5.75x6.2x1.9	PS2 KB,mouse,VGA,USB,RJ45 2S,1P,AUDIO,GAME	1slim	0/1slim	0	0
111M.NLX 370	260	11.5x10.6x2.5	PS2 KB,mouse,VGA,USB,RJ45 2S,1P,AUDIO, GAME,1394	w/slim CD	0/2.5 HD	2 or 0	
192 M.ATX 370	185	13.8x16.5x3.4	PS2 KB,mouse,VGA,USB,RJ45 2S,1P,AUDIO,GAME	1	1/1	3 or 0	
192B M.ATX 370	185	13.8x16.5x3.4	PS2 KB,mouse,VGA,USB,RJ45 2S,1P,AUDIO,GAME	1	1/1	3 & 0	

Case Specification & Price List

Model	Price	Dimension W.D.H.	MB Size	5.25 Ext./Int.	3.5 Ext./Int.	P.S.
R02/BARE	180/300	19x17.6x3.5	M.ATX	1/0	1/1	150W
R04B/W	275	19x24.3x3.5	ATX	1/0	1/3	250W
R05B	430	19x242x3.5	ATX	1/0	1/4	430W
R06B	250	19x20.2x5.25	ATX	4/0	1/5	300W
R08 B/W	1550/1800	19x22x3.5				
R14 B/W	215	19x21x7	ATX	3/0	1/3	300W
R15	295/510	19x24.4x7	ATX	6/0	2/2	300W
R16 B/W	225	19x18x7	ATX	3/0	1/2	250W
R17 B 4U	215	19x21x7	ATX	3/0	1/2	250W
R20 B/W	275	19x20.5x7		8/0		300W
R21 B/W	275	19x18x7		8/0		300W
R26R/B/W	630/850	19x22.6x10.7	ATX	4/0	2/4	300W/R
R28	290	19x17x8.7		8/0		300W
RSP	18	5.8x9.3x1.6			1	
RSM169-100	65/75	5.8x9.3x1.6			1	
001B	75	10x11.5x3		1/0		60W
001B1	65	8.3x10.6x2.8		1/0		50W
002B	88	6.9x14.6x5.8		2/0		60W
002B1	78	7.5x11.2x6.5		2/0		80W
004B	105	6.8x15.3x9.3		4/0		230W
004B1	100	7.5x17.3x10.2		4/0		200W
007B	180	7x15.8x13		7/0		250W
008B	280	8.4x20.2x18.3		8/0		300W
008B1	180	7.5x17.9x17.1		8/0		250W
105LPX/TV	255/275	11.9x12.6x3	LPX	1/0	1/1	90W
107 bare	395	5.75x6.2x1.9		1slim/00/1slim		
111N bare	260	11.6x10.6x2.5	M.NLX	1/0	0/1	100W
192M.ATX/B	85	13.1x16.5x3.5	M.ATX	1/0	1/1	150W
224	75	17.4x18.8x6.1	ATX	3/0	2/2	230W
267	70	16.8x16.8x6.2	ATX	2/0	2/1	250W
271	85	17.3x15.9x5.5	ATX	2/0	1/1	250X
288	75	16.9x17x6	ATX	3/0	2/1	230W
304	70	7.9x18.8x13.9	ATX	3/0	2/1	300W
325B	55	8x18.5x17	ATX	3/0	2/1	235W
338	55	7x14.7x13.8	M. ATX	2/0	2/1	145W
366	50	7.2x15.5x14.3	M. ATX	2/0	1/1	235W
367	55	7.7x16.5x17	ATX	3/0	2/1	235W
370	80	8.3x17.3x16.1	ATX	3/0	2/2	250W
392	80	7.5x17x17	ATX	3/0	2/2	250W
393	90	9x17.5x17.5	ATX	6/0	1/1	250W
401	110	8.5x17.3x18	ATX	2/0	2/2	250W
404	105	8x18.8x17	ATX	4/0	2/2	320W
405B	75	7.8x17.5x17.2	ATX	4/0	2/2	320W
409	295	9.5x22x18.1	ATX	4/0	2/5	300W
411	67	7.2x17.2x16.8	ATX	4/0	2/1	250W
412	67	7.2x17.2x16.8	ATX	4/0	1/2	250W
413BL	67	8.5x19.5x18	ATX	4/0	2/1	250W
415	75	8.8x19.5x19.7	ATX	8/0	1/0	300W
418B/W	115	8.1x18.8x21.4	ATX	4/0	2/4	300W
422	70	7.7x16.6x18.1	AT	4/0	1/4	250W
424	70	7.5x18.9x16.7	ATX	4/0	2/1	250W
426B/W/S	70/75	7.5x17.5x19.3	ATX	3/0	2/2	250W
427	75	7.5x16.5x17.3	ATX	3/0	2/2	250W
430 BL/BK	220	8.25x19.75x18	ATX	4/0	3/6	300W
436	70/85	8.6x18x15.6	ATX	3/0	2/2	250/300W
443	75	8x18.8x17	ATX	4/0	2/2	300W
467	75/90	7.5x16.7x18.8	ATX	3/0	1/4	250W/300W
470	110	8.3x17.3x21.3	ATX	4/1	1/2	250W
471	110	8.4x17.5x21.3	ATX	3/1	1/4	250W
472	60	7.5x18x17.6	ATX	4/0	2/2	250W
474	285	7.8x17.2x17.2	ATX	4/0	2/2	300W
476	70	8x17.2x17	ATX	4/0	2/2	300W
477BL	75	8.75x17.5x17	ATX	4/0	2/2	300W
478	155	7.9x18.4x16.4	ATX	4/0	2/1	300W
480	195	7.8x18x16.5	ATX	4/0	2/1	300W
482B	80	7.8x19.8x17.5	ATX	4/0	2/2	250W
486	67	9.6x19.5x17	ATX	4/0	2/1	250W
487B/W	105	8.25x18.4x21.25	ATX	4/0	2/4	300W
489**	80	7.3x17x17	ATX	3/0	1/2	235W
492	229	8.3x19.5x17.6	ATX	4/0	3/5	300W
493B	234	8.3x19.5x17.6	ATX	4/0	3/5	300W
494	229	8.3x19.5x17.6	ATX	4/0	3/5	300W
496	60	8.25x17.8x16.5	ATX	4/0	1/3	250W
501	155	8.25x17.2x23.8	ATX	4/0	2/4	300W
503R/B	455	14.8x20.4x18.4	ATX	8/0	2/4	300RW
503/B	295	14.8x20.4x18.4	ATX	8/0	2/4	300W
505	555	14.6x23x26.8	ATX	12/0	1/8	300W
505R	670	14.6x23x26.8	ATX	12/0	1/8	300RW
518	145	8.1x18.5x26.5	ATX	6/0	2/6	300W
524	380	13.9x25.6x19.1	ATX	7/0	1/2	300RW
526B/W	105/120	7.5x17.5x24.5	ATX	6/0	1/4	250W/300W
528	95/110	7.5x16.5x24.8	ATX	6/0	1/5	250W/300W
536	93/108	7.8x17x24	ATX	5/0	1/5	250W/300W
560/R	290/445	15x24.5x23.5	ATX	11/0	2/4	300W/300R
562/R/B/W	250/470	8.7x17.9x26.8	ATX	9/1	1/0	300W/300R
563/RB/W	145/370	8.7x17.9x26.8	ATX	10/0		300W/300R
565	185	9.25x18.3x21.2	XEON/ATX	4/0	2/4	300W
569B/W	210	13.5x17.8x14	B/ATX	6/2	0/8	300W/300W
570/R	150/370	8.3x17.3x26.4	ATX	7/1	1/2	300W/300R
571/R	160/370	8.3x17.3x26.4	ATX	6/1	1/2	300W/300R
582	105/120	7.8x16.5x23.2	ATX	6/0	2/1	250W/300W
588	99/114	7.8x16.5x23.3	ATX	5/0	1/3	250W/300W
592	315	8.2x23.5x23.5	ATX	6/0	3/6	300W
1620/R	950	16.5x20.3x34.3	F/ATXx2	16/0		300R

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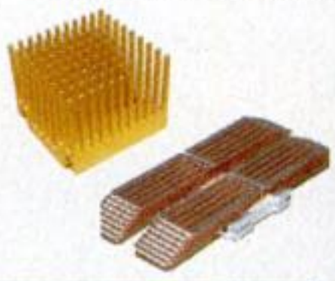

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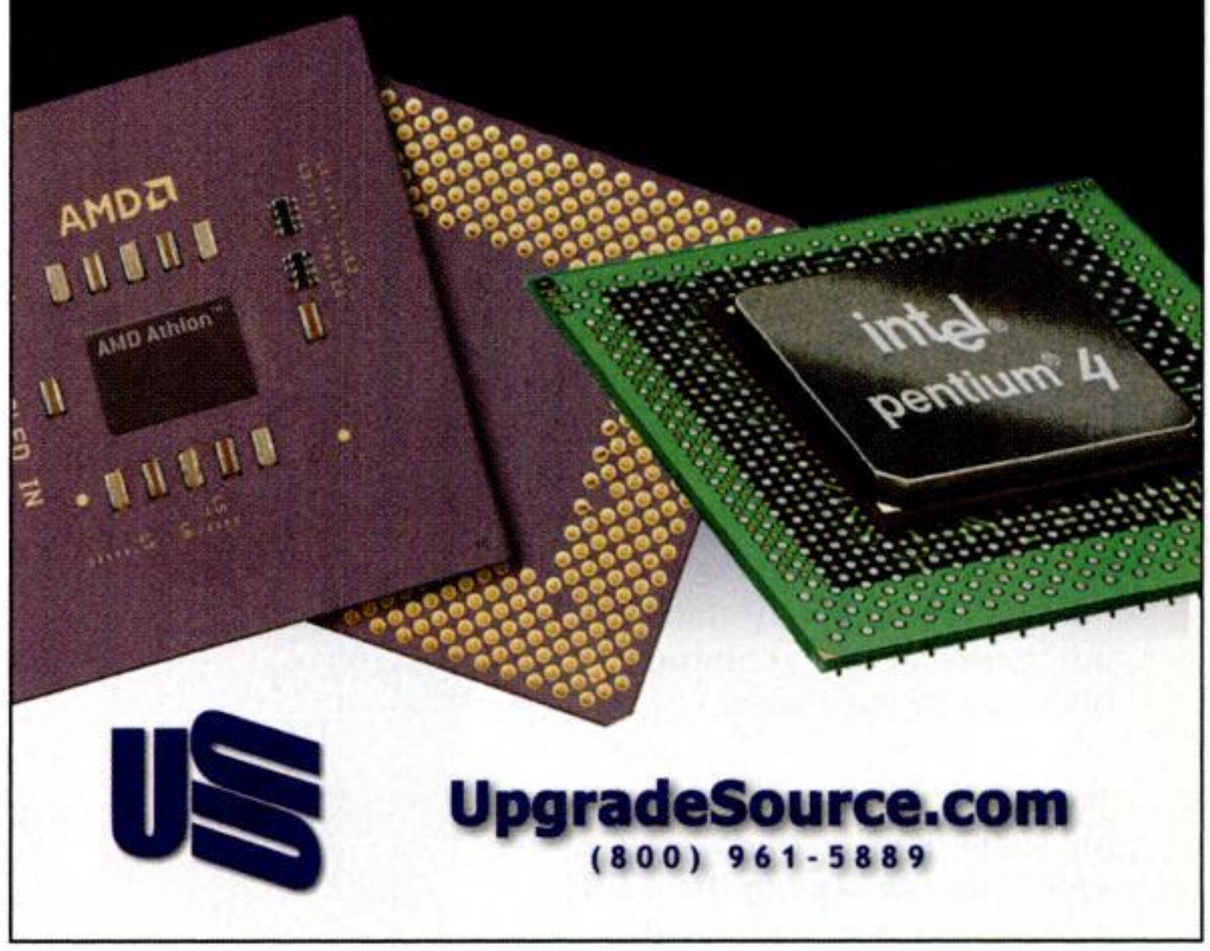

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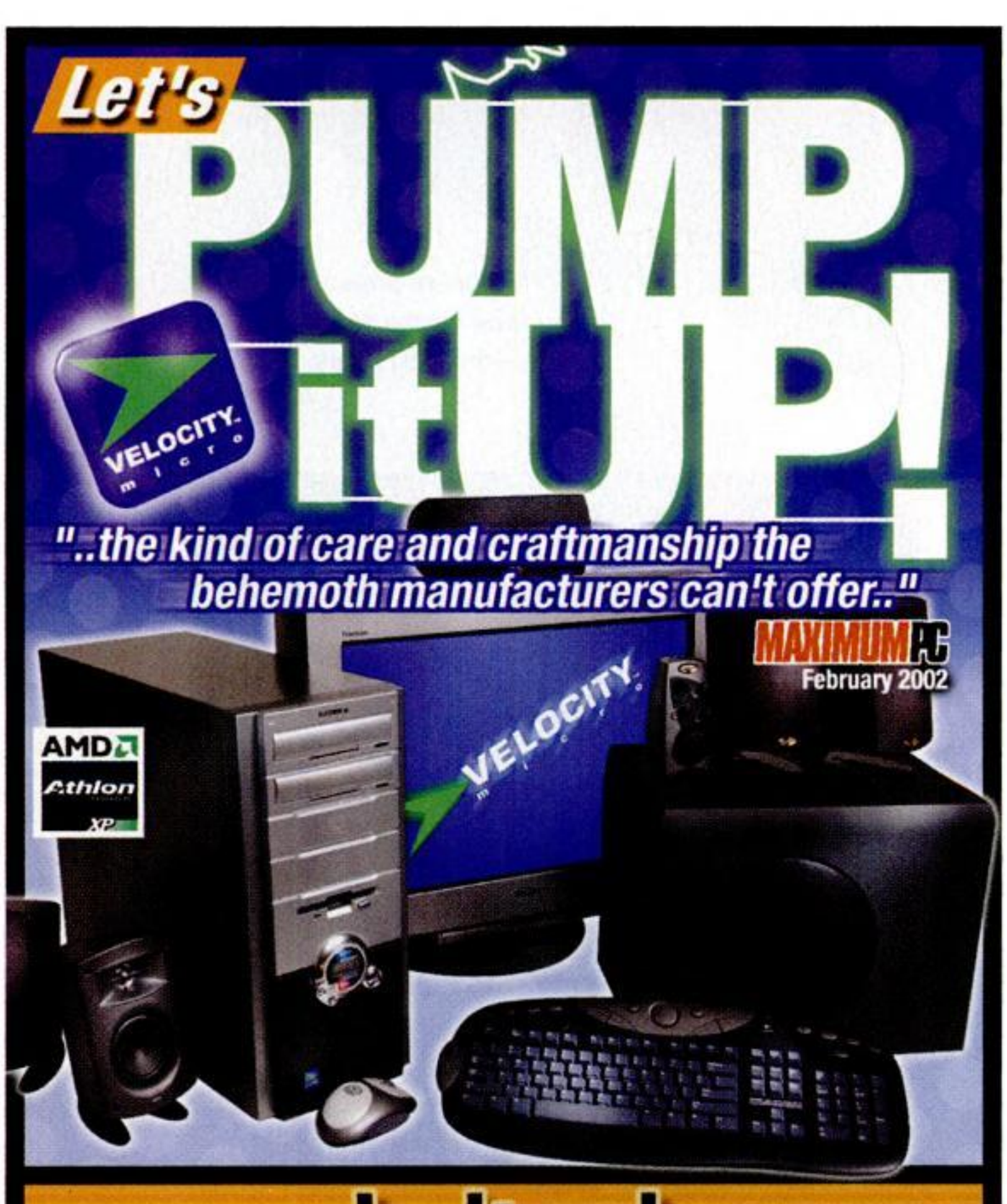

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MAXIMUMPC Rig of the Month

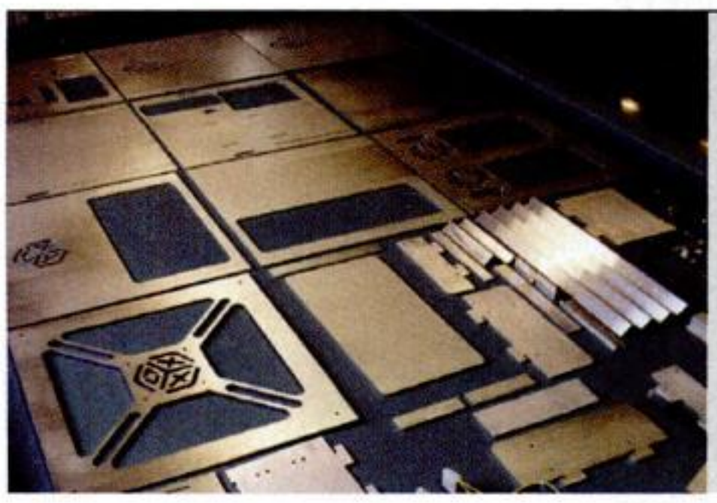
THIS MONTH: Dennis Vieren's Frozen Case

Let the Frozen Case be a lesson to all the world's case-modding upstarts who think they've created something special: You haven't accomplished jack unless you've designed, fabricated, and assembled your case from absolute scratch. That's right, kiddies, Mr. Vieren planned out his case in *AutoCAD,* then fed the resulting illustration files into a machine that laser-cut his parts from 3mm aluminum. The rig's innards are relatively standard, but there's nothing commonplace about the chassis.

The entire project—from initial design to laser cutting—took 250 hours.

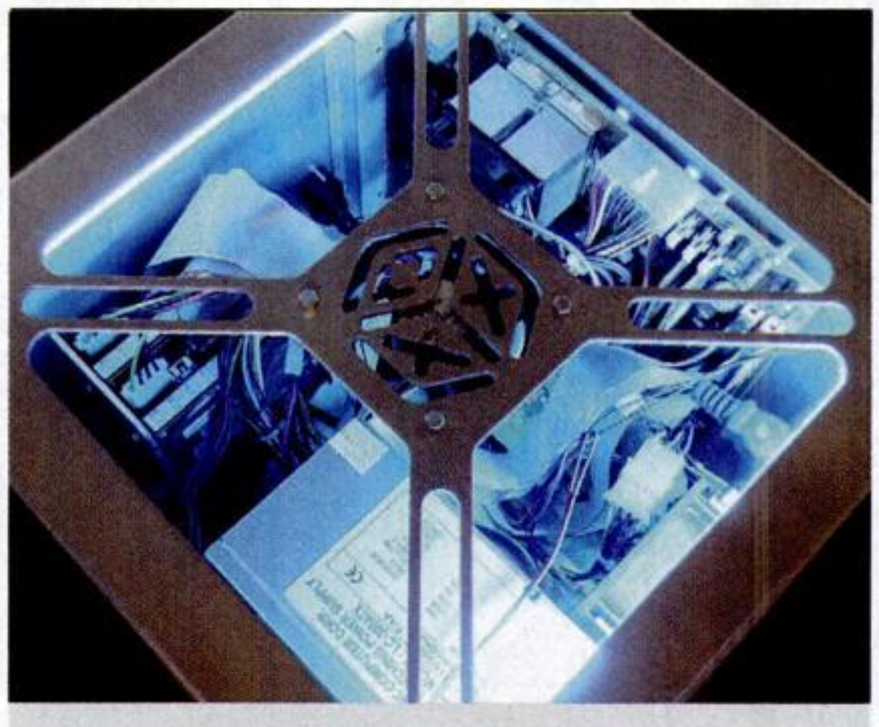
Tell us about your CAD process. My sister is an architect, and as a kid I always liked to draw CAD designs much more then she did. I also have a lot of 3D experience because I draw 3D characters and worlds as a hobby. We have *AutoCAD 2002* where I work, so I used that software to draw the parts. The laser machine reads and burns the parts directly from the program's dxf files. The total cost was about $300 to $400 U.S. for the materials, plus some sweat.

When designing the box, how did you account for potential cooling issues? I thought about it a lot, and did rough sketches in 3D, so I could look and study where the air could flow. I placed rough models of all the computer parts in it and looked at how they would interfere with the airflow, and adjusted the design where needed.



"There are eight screws and four long bolts that hold the whole thing together. The bolts come out on the corners of the top and bottom plates. The lid can be taken off if you loosen the four nuts at the top, and the rest slides apart like a puzzle."

"The aluminum does very little for cooling, but the design does. The case has two inward-blowing fans on the bottom, one outward fan on top, and one outward fan on the front, all of which make for excellent airflow."



Key hardware includes an Athlon 1200, an Abit KT7A RAID motherboard, two 60GB IBM drives in RAID 0, and an Elsa GeForce3. We have no idea who made the blue lighting, but we do know that Vieren's case is reminiscent of an arctic-blue ice cube. You can find more info at www.frozencase.com.

If you have a contender for Rig of the Month, e-mail **input@maximumpc.com** with pics and a brief write-up.

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THE ULTIMATE MOBILE GAMING MACHINE

Area-51-M™: Mobile Gaming

The Area-51-M™ represents the first fully capable mobile gaming solution. The performance requirements of today's most cutting edge games has been simply too demanding for a laptop unit, until now. Introducing the brand new Area-51-M™, our flagship mobile gaming machine.

The Area-51-M™ plays games at blistering speeds, and performs phenomenally high in benchmarks. The beautiful super-crisp LCD display handles quick motion with incredible accuracy previously unmatched by any other mobile LCD display. Perfect for LAN parties and for those who simply cannot part from their desktop system's performance, the Area-51-M™ is the ultimate mobile gaming machine.

AREA-51-M™ MOBILE GAMING

Intel® Pentium® 4 Processor at 2.4GHz and 512KB Advanced Transfer Cache
High-Performance Heatsink/Cooling with Arctic Silver III
Intel® 845MP+ ICH3M Chipset Motherboard
512MB DDR SDRAM (PC-2100)
40GB ATA100 Hard Drive
15.0" UltraXGA+ TFT Active Matrix LCD
ATI Mobility Radeon 7500 64MB DDR with Dual-View Display Monitor and TV-out
Removable 3.5" Floppy Drive
8X/8X/24X DVD-ROM/CD-RW Combo Drive
Wavetable 3D Stereo with S/PDIF Digital Output
Front Panel Audio DJ CD Player
Allows CD Play While System is On or Off
One Type II PCMCIA Slot
Four USB Ports and One IEEE 1394 Port
Infrared Wireless Fast IR Interface
10/100MB Ethernet LAN and 56K Modem
Dimensions: (H) x (W) x (D) : 1.7" x 13" x 11.4"
Weight: 7.6lbs. without battery
Exclusive 120-Watt A/C Adapter
Microsoft® Windows® XP Professional
1-Year Toll-Free 24/7 Technical Support
AlienAutopsy: Automated Technical Support
Personalized Owner's Manual
Optimized & Configured for High-Performance
FREE Alienware® Custom Mouse Pad

$2,599.00

The Alienware® Difference

- Built by Skilled Alienware® Technicians
- Stringent 200-point Quality Control Process
- Fully Upgradeable with No Proprietary On-board Components
- The Most Advanced and Personalized Online Customer Support Available
- **AlienAutopsy: Automated Technical Support Request System**

FOR A LIMITED TIME ONLY!

ALIENWARE® MICE

$59

Available in many Custom Colors!

Visit us at www.alienware.com/gearshop

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ROSWELL™

Intel® Pentium® 4 Processor at 2.0GHz
High-Performance Heatsink/Cooling System
Intel® 845D Chipset Motherboard
512MB DDR SDRAM (PC-2100)
Black Floppy Drive 1.44MB
20GB 7200RPM Ultra ATA100 System Drive
80GB 7200RPM Ultra ATA100 A/V Drive
NVIDIA® GeForce4™ MX-440 64MB DDR
Koolmaxx™ Video Cooling System
Pinnacle® Systems Studio Deluxe
SoundBlaster® LIVE!™ 5.1 Sound Card
16X/48X DVD-ROM Drive
Black Dragon Full-Tower ATX Case 340-Watt PS
Black 107-Enhanced Keyboard
Black Microsoft® Intellimouse Explorer
Intel® PRO/100 S Network Adapter
Microsoft® Windows® XP Professional
1-Year Toll-Free 24/7 Technical Support
AlienAutopsy: Automated Technical Support
Personalized Owner's Manual
Optimized & Configured for High-Performance
FREE Alienware® Custom Mouse Pad

$1,999.00

2001 DV™

Intel® Pentium® 4 Processor at 2.53GHz with 533FSB and 512KB Advanced Transfer Cache
High-Performance Heatsink/Cooling System
Intel® 850E Chipset Motherboard
512MB RDRAM (PC-1066)
Black Floppy Drive 1.44MB
60GB 7200RPM Ultra ATA100 A/V Drive
200GB 7200RPM Ultra ATA100 16MB Cache RAID Array
Promise® FastTrack 100TX2 RAID Controller
NVIDIA® GeForce4™ Ti 4600 128MB DDR
Koolmaxx™ Video Cooling System
Pinnacle® PRO-ONE Editing System
SoundBlaster® Audigy™ Platinum 5.1 Sound Card
16X/48X DVD-ROM Drive
Pioneer DVR-A04 DVD-R/CD-RW Drive
Black Dragon Full-Tower ATX Case
Enermax EG651P-VE 550-Watt Power Supply
Black 107-Enhanced Keyboard
Black Microsoft® Intellimouse Explorer
Intel® PRO/100 S Network Adapter
Microsoft® Windows® XP Professional
1-Year Toll-Free 24/7 Technical Support
AlienAutopsy: Automated Technical Support
Personalized Owner's Manual
Optimized & Configured for High-Performance
FREE Alienware® Custom Mouse Pad

$4,899.00

MJ-12™

Dual Intel® Pentium® 4 Xeon Processors at 2.4GHz with 512KB Advanced Transfer Cache
High-Performance Heatsink/Cooling System
Supermicro® Intel® i860 Chipset Motherboard
1024MB RDRAM NON-ECC (PC-800)
Black Floppy Drive 1.44MB
180GB Ultra160 SCSI Hard Drive 16MB Cache
Adaptec 32-bit Dual-Channel Ultra160 SCSI Controller
NVIDIA® Quadro4™ 900 XGL 128MB DDR
Koolmaxx™ Video Cooling System
SoundBlaster® Audigy™ 5.1 SB1394™
16X/48X DVD-ROM Drive
Plexwriter 40X/12X/40X CD-RW IDE
Black Xeon Full-Tower EATX Case 420-Watt PS
Black 107-Enhanced Keyboard
Black Microsoft® Intellimouse Explorer
10/100Base-T Network Adapter
Microsoft® Windows® XP Professional
1-Year Toll-Free 24/7 Technical Support
AlienAutopsy: Automated Technical Support
Personalized Owner's Manual
Optimized & Configured for High-Performance
FREE Alienware® Custom Mouse Pad

$6,299.00

NEC MONITORS

19" NEC 95F	Flat CRT	$329.00
19" NEC FE950+	Flat CRT	$389.00
22" NEC FE1250+	Flat CRT	$819.00
18" NEC 1850X	LCD	$1659.00
20" NEC 2010X	LCD	$2129.00

KLIPSCH SPEAKERS

Klipsch ProMedia 2.1	200-Watt THX-Certified	$179.00
Klipsch ProMedia 4.1	400-Watt THX-Certified	$299.00
Klipsch ProMedia 5.1	500-Watt THX-Certified	$399.00

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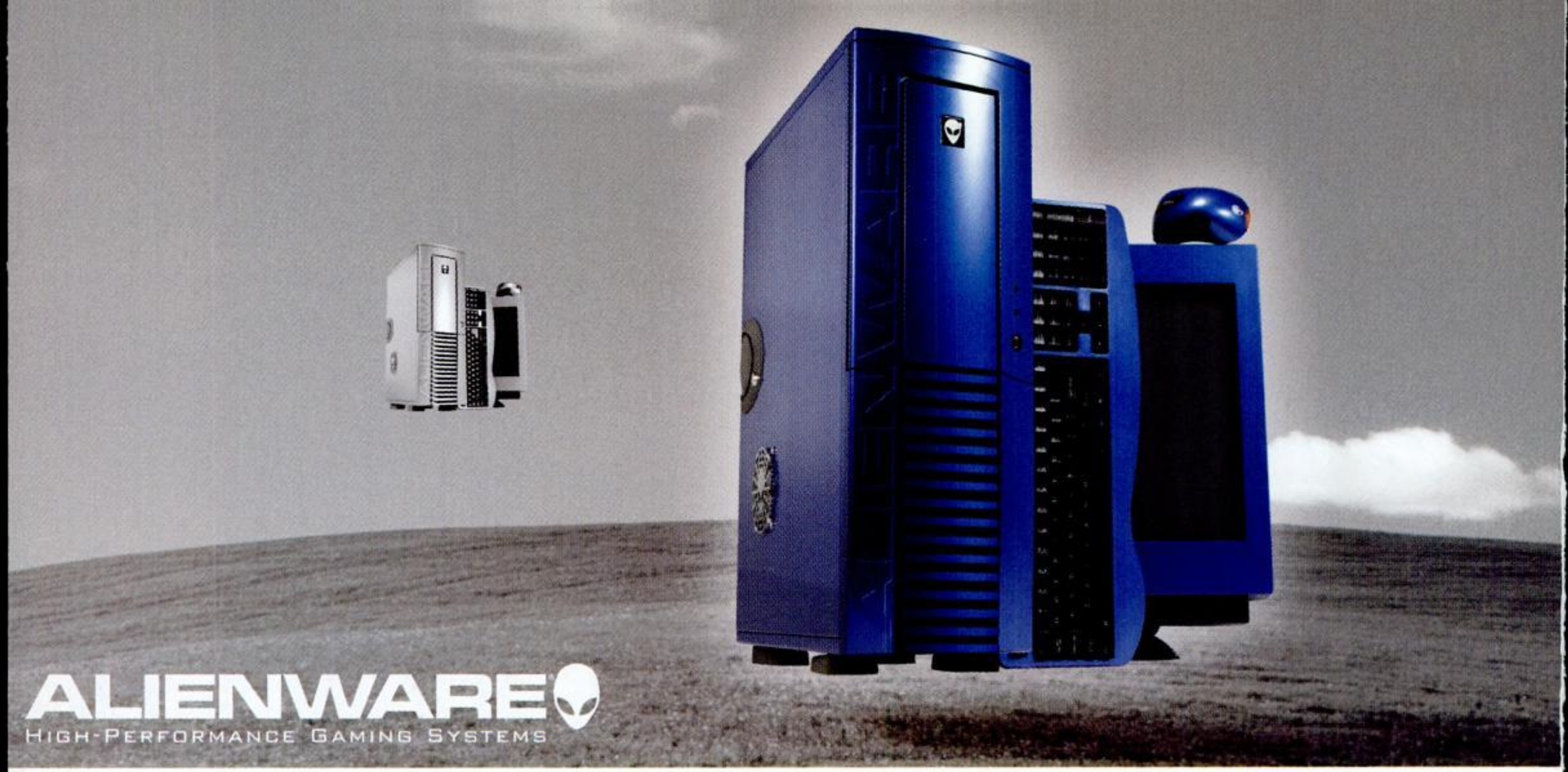

Under the Hood

At Alienware® our selection of components is just as important as building the actual system. We do not use any proprietary components and every single item we put inside the case is guaranteed to be the highest quality component available at that time. Simply put, our computers are the best systems available.

Incredible Attention to Detail

Every Alienware® system undergoes a 200-point quality control process. During this process every wire is neatly secured and routed as to not interfere with proper air flow within the chassis. Every system that leaves our factory is regarded as a work of art, hand built by technicians who take enormous pride in their work.

Is Beauty Only Skin Deep?

What good is a beautiful interior without a complementary exterior? Alienware® systems are available in a variety of intense custom colors. This includes cases, mice, keyboards, monitors, and even speakers. The stunning metallic finish of your new Alienware® system is enough to turn anyone green with envy!

Is There Life Beyond Gaming?

So how does a system built for gaming perform in other tasks? The most demanding tasks a computer system can perform are those which involve complex graphic and video calculations. As a result, a system built for gaming performs above and beyond any standard system's expectations.

"Alienware®'s latest system could make even HAL 9000 jealous!"
- PC Gamer

"Computer Gaming World's Ultimate Gaming Champion!"
- Computer Gaming World

"There can only be one. The winner is clearly Alienware®!"
- Computer Games

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Custom Build your Dream Machine at
WWW.ALIENWARE.COM

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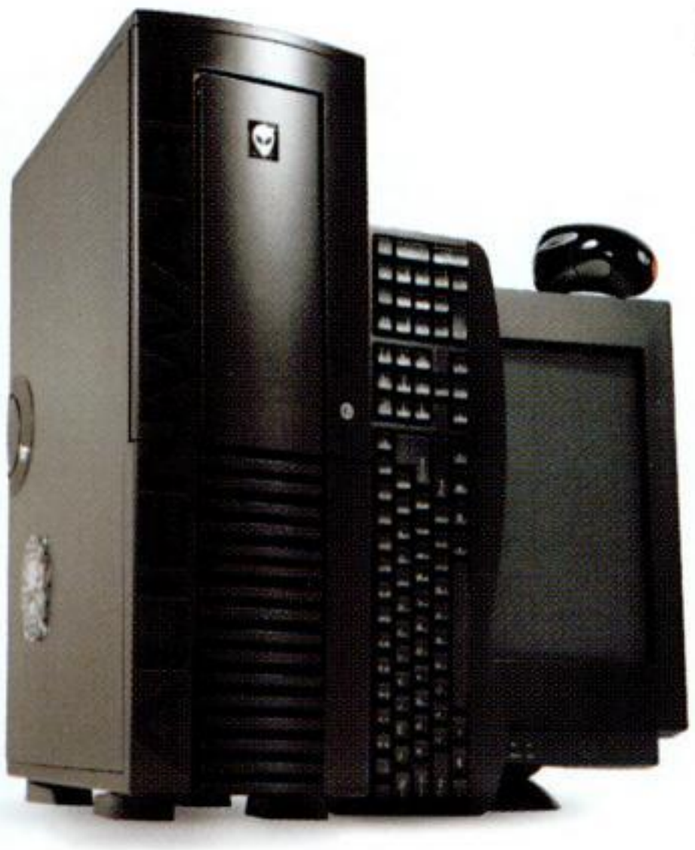

"The fastest PC we've ever tested, bar none!"

- Maximum PC

MAXIMUM PC KICK ASS! product

Award-Winning Systems

With an Alienware® system, PC gaming is taken to a new level unmatched by standard PC systems. Alienware® systems are available in many custom colors and with the most advanced graphics rendering hardware available and intense theater quality sound. Our systems will leave you wondering why you ever played games on anything else.

AREA-51™

Intel® Pentium® 4 Processor at 2.53GHz with 533FSB and 512KB Advanced Transfer Cache
High-Performance Heatsink/Cooling System
Intel® 850E Chipset Motherboard
512MB RDRAM (PC-1066)
Black Floppy Drive 1.44MB
120GB 7200RPM Ultra ATA100 Hard Drive 8MB Cache
NVIDIA® GeForce4™ Ti 4600 128MB DDR
Koolmaxx™ Video Cooling System
SoundBlaster® Audigy™ 5.1 SB1394™
16X/48X DVD-ROM Drive
Plexwriter 40X/12X/40X CD-RW IDE
Black Dragon Full-Tower ATX Case
Enermax EG651P-VE 550-Watt Power Supply
Black 107-Enhanced Keyboard
Black Microsoft® Intellimouse Explorer
Intel® PRO/100 S Network Adapter
Microsoft® Windows® XP Professional
1-Year Toll-Free 24/7 Technical Support
AlienAutopsy: Automated Technical Support
Personalized Owner's Manual
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$2,999.00

Available in many custom colors!

ALIENWARE®

Custom Build your Dream Machine at **WWW.ALIENWARE.COM**
For More Information Call Toll-Free: 800.494.3382

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